NORTHEAST FLOOD STUDIES

REPORT

ON

REVIEW OF SURVEY

FOR

FLOOD CONTROL AND ALLIED PURPOSES

ANDROSCOGGIN RIVER BASIN

MAINE AND NEW HAMPSHIRE

IN TWO VOLUMES

VOLUME I

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

15 APRIL 1965

good quality and produces commercially valuable species of timber such as spruce, fir, pine, beech, and birch. Large holdings of forest lands are managed for sustained yields.

18. MINERALS

Various mineral deposits are found in the Androscoggin River basin, the most important being sand, gravel, and pegmatite. Data are not available on the total production of sand and gravel but the output based on 10 producers exceeds that of any other mineral commodity in tonnage and value in the basin. Pegmatite materials, found in the middle and southern part of the basin, are mined for feldspar, beryl, and mica, these sources accounting for most of the output of these materials in the state of Maine. Other mineral commodities commercially utilized in the basin are: clay for paper and allied products, ceramic and brick; granite for building material; and peat for agricultural purposes. Estimated reserves of air-dried peat are believed to be about 2,000,000 tons.

SECTION VI - EXTENT AND CHARACTER OF FLOODED AREA

19. GENERAL

Stretches of the Androscoggin's main valley on both sides of the river are subject to flooding in the lower 130-mile length of the river below Berlin. The relatively steep slope of the stream combined with the topography of the valley precludes extensive areal flooding; however, the areas subject to inundation are moderately well developed. A substantial portion of the basin's industrial complex is located in the flood plain as well as key segments of its transportation network and public utilities. Residential and commercial properties in the larger communities along the stream are also flood-prone, particularly in Rumford, Mexico, Lewiston and Auburn in Maine and in Gorham, New Hampshire. Agriculture, a declining segment in the valley's economy, suffers only minor losses. Manufacturing, the largest source of employment in the basin, suffers most from flooding. Mainly oriented toward paper making, the area's industry also produces textiles, leather products and gypsum products.

SECTION VII - FLOOD DAMAGES

20. EXPERIENCED FLOOD DAMAGES

The record flood of March 1936 caused damages estimated at $4,392,000 and completely disrupted the normal economy of the basin.

Four lives were lost and 1,500 families were made temporarily homeless. Communication in the valley and with the outside world was practically cut off as eighteen bridges were destroyed, rail and road facilities were extensively damaged and telephone and telegraph facilities were severed. Some of the valley towns were without power and water. Over 40 percent of the damages were to industry, 20 percent were to urban properties and the rest to highways, railroad and utilities. All but $160,000 of the losses were in the State of Maine. The second greatest flow at the Rumford gage was recorded in April 1895; however, no damage information is available on this flood. The third largest recorded flood in the Androscoggin River basin occurred in March 1953. Total damages in the 1953 flood were estimated at $2,230,000. Significant areas of damage in this flood occurred along the main river from Berlin to Brunswick, and on three of the tributary streams, the Dead River in New Hampshire and the Swift and Little Androscoggin Rivers in Maine. Industrial losses represented the largest single item of loss, almost 40 percent, with other principal losses occurring to urban (residential and commercial), public utilities, and the transportation network. In Mexico, at the junction of the Swift River and the main stem of the Androscoggin, 100 families evacuated their homes and the entire business section of the town was closed as the Swift River overflowed Main Street.

21. RECURRING LOSSES

Based on a recent field review of potential losses in the Androscoggin River valley, a recurrence of the record flood of March 1936, under current economic conditions, would cause losses estimated at ~~$12,500,000~~ $13,700,000 along the main stem of the river from the Sawmill Dam in upper Berlin to tidewater at Brunswick. Twenty industrial complexes, employing over 9,000 people, would suffer the major share of the damages, 65 percent of the total estimated loss. Pulp and paper product manufacturers at Berlin and at Rumford, Jay, Livermore Falls and Topsham, Maine as well as textile plants at Lewiston, Lisbon Falls and Brunswick, Maine would be hardest hit.

22. AVERAGE ANNUAL LOSSES

Recurring losses for various stages of flooding were converted to average annual losses by correlation between stage-discharge and discharge-frequency relationships in each of 15 damage reaches of the main river. Average annual losses on the main stem amount to ~~$621,000~~ $735,000 under current economic conditions, and ~~$751,000~~ $830,000 after adjustment for expected growth.

23. TRENDS OF DEVELOPMENT

The Androscoggin River basin has a stable, relatively prosperous economy. Back-boned by the paper making industry, the basin in Maine is a highly industrialized portion of the state. The section of the river in New Hampshire below the Sawmill Dam at Berlin has an economy geared to one large paper company. Based on past and current economic development in the basin, an overall economic growth rate of 0.75 percent annually over the next 50 years is considered probable in the Maine portion of the basin with a leveling off trend probable for the 50-year period thereafter. In New Hampshire, while little growth is expected, the progressive policies of the one company which governs industry in the area makes it unlikely that there will be any decline in the area's economy in the future.

24. FUTURE ANNUAL LOSSES

Flood damages in the Maine portion of the basin can be expected to increase at least as fast as the overall economic growth rate. On an average annual equivalent basis, losses will be increased by 18.6 percent in the reaches from Rumford to tidewater at Brunswick. Average annual losses over the life of the project under future conditions amount to $830,000 at 1966 price levels.

SECTION VIII - IMPROVEMENTS BY FEDERAL AND NON-FEDERAL AGENCIES

25. EXISTING IMPROVEMENTS BY FEDERAL AGENCIES

No Federal agencies have constructed any projects for flood control or other beneficial use of water in the basin.

26. PROPOSED IMPROVEMENTS BY OTHER FEDERAL AGENCIES

The Soil Conservation Service, United States Department of Agriculture, pursuant to authority contained in the Watershed Protection and Flood Prevention Act under Public Law 566, is investigating flood-water retarding facilities in the Dead River watershed in New Hampshire and in the Nezinscot River watershed in Maine. Projects under consideration include small earth-fill retarding structures with self-regulating outlet works and grassed spillways, and channel improvements.

39. ANNUAL CHARGES

Annual charges are based on an annual interest rate of 3-1/8 percent for Federal financial costs with amortization of the project cost distributed over a 100-year period. Allowances are made for maintenance, operation and major replacement costs and for tax loss on lands transferred to Federal ownership.

40. COST ESTIMATE

Estimates of first costs and annual charges for the Pontook project are given in Table 4.

SECTION XIII - ANNUAL BENEFITS

41. FLOOD PREVENTION BENEFITS

Flood damage prevention benefits were derived as the difference between annual losses expected in the basin under projected conditions over the next hundred years and those remaining after construction of the Pontook project. Benefits for flood reductions between Berlin and tidewater at Brunswick credited to the project amount to ~~$204,000~~ $224,000 annually.

Important intangible benefits on which a monetary value cannot be placed would also be realized as a result of the proposed project. The reservoir, through reduction in flood stages and durations, would increase the safety and well being of the population of the area affected by reducing the hazard of possible loss of life, and increasing the overall security of the downstream areas.

42. HYDROELECTRIC POWER BENEFITS

Hydroelectric power benefits are based on the equivalent cost of providing power by the most likely alternate source which, in this study, is considered to be a privately-financed steam plant to serve the same market area. Power values were derived by the Federal Power Commission on the following basis:

(1) Based on past and expected growth in the power market area to be served by the proposed project, the output of the proposed installation could be readily and effectively absorbed as soon as available.

be credited with the wages paid to such labor. The "redevelopment" benefit to such employment is estimated to be $5,000,000. Expressed as an equivalent annual value, this amounts to $148,000.

46. SUMMARY OF BENEFITS

The total annual benefits creditable to the project for flood control and allied purposes are summarized in Table 5.

TABLE 5

SUMMARY OF AVERAGE ANNUAL BENEFITS
(1964 Price Level)

Source of Benefit		
Flood Prevention	~~$ 204,000~~	~~$224,000~~
Hydroelectric power	~~3,594,000~~	
General recreation	289,000	
Sub-total	~~$4,087,000~~	
Redevelopment	~~148,000~~	~~$ 167,000~~
Total annual benefits	~~$4,235,000~~	

SECTION XIV - PROJECT FORMULATION AND ECONOMIC JUSTIFICATION

47. GENERAL

The Pontook project considered herein will provide the most practicable and economic means at this time for the continued development of the water resources potential of the basin. It harnesses for public use one of the last major undeveloped areas in the basin. Each of the purposes included in the project is adequately warranted.

The benefit-cost ratio for the project, exclusive of redevelopment benefits is 1.7. With redevelopment benefits, the benefit-cost ratio is 1.8.

REPORT

ON

REVIEW OF SURVEY

FOR

FLOOD CONTROL AND ALLIED PURPOSES

ANDROSCOGGIN RIVER BASIN
MAINE AND NEW HAMPSHIRE

IN TWO VOLUMES

VOLUME I

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS, WALTHAM, MASS.
15 April 1965

SYLLABUS

The Division Engineer finds that there is a need for flood protection to prevent destructive floods from disrupting the normal economy of the Androscoggin River basin. Extensive areas in industrial, commercial, and residential communities along the main stem and tributaries are subject to serious flooding. He further finds that additional facilities for generation of hydroelectric power and water-oriented recreation are also needed in the basin.

The Division Engineer recommends construction of the multiple-purpose Pontook project as the next step in the continuing development of the water resources of the Androscoggin River basin. The project would provide for storage of waters for flood control, for hydroelectric power generation, and for recreation. The main dam, 115 feet high, would impound 58,000 acre-feet exclusively for flood control, 141,000 acre-feet for flood control and power generation, and 39,000 acre-feet of dead storage. Generating facilities totalling 135,000 kilowatts would be installed in a powerhouse located at the downstream toe of the dam and would produce an average of 107,000,000 kilowatt-hours of energy annually. The normal full power pool would create a lake about $13\frac{1}{2}$ miles long with a surface area of 10 square miles, ideal for development

of water-oriented recreational activities. Releases from the main powerhouse would be regulated to uniform flow conditions for downstream users by construction of a reregulating dam about $3\frac{1}{2}$ miles below the main dam. Generating facilities totalling 3,000 kilowatts incorporated in the reregulating dam would produce an average of 18,000,000 kilowatt-hours of energy annually.

The initial recreational development would provide basic facilities for some 2,500 persons at any one time. These facilities would include beaches, picnic areas, camp sites, boat launching ramps, parking areas, and necessary sanitary works. It is estimated that, initially, 110,000 people will visit the area and utilize the recreational facilities annually.

The recommended plan of improvement has widespread support in the area. Statements presented at meetings showed that both State and local officials as well as residents of the basin generally favor the plan because of the benefits it will bring in flood protection, power generation, increased recreational opportunities, and improvement to the lagging economy of that part of the State.

The total initial first cost of the project is $56,000,000. Average annual costs for operation, maintenance, and major replacements are estimated at $426,000. The project has a benefit-cost ratio of 1.8 to 1.

REPORT ON REVIEW OF SURVEY FOR FLOOD CONTROL AND ALLIED PURPOSES

ANDROSCOGGIN RIVER BASIN MAINE AND NEW HAMPSHIRE

TABLE OF CONTENTS

PHOTOGRAPHS

TABLES

PLATES

ATTACHMENTS

APPENDICES (Volume II)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASS. 02154

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO.
NEDED-R

15 April 1965

SUBJECT: Report on Review of Survey for Flood Control and Allied Purposes, Androscoggin River Basin, Maine and New Hampshire

TO: Chief of Engineers
ATTN: ENGCW-PD

SECTION I - AUTHORITY

1. AUTHORIZING RESOLUTION

Following the New England hurricane floods of 1955, the Committee on Public Works of the United States Senate, on 21 November 1955, adopted a resolution which reads, in part:

> "That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review previous reports on the . . . . . Androscoggin River, Maine and New Hampshire . . . . . with a view to determining the desirability of modifying the recommendations contained in such previous reports and the advisability of adopting further improvements for flood control and allied purposes, in view of the heavy damages and loss of life caused by recent hurricane floods in the New England area."

SECTION II - SCOPE

2. SCOPE OF REPORT

This report comprises a review of the flood and related water resource problems in the Androscoggin River basin, presents the results of the investigations, and makes specific recommendations in the interest of water resources development. This is the first in a series

of reports in response to the authorizing resolution which covers all of the primary rivers and intervening streams in Maine and New Hampshire between the Canadian border and the Merrimack River. The area covered by this report is shown on Plate No. 1.

3. SCOPE OF INVESTIGATION

a. Surveys and studies. Maps prepared by the Corps of Engineers for use in studies for prior flood control reports, maps prepared by the U. S. Army Map Service and the U. S. Geological Survey, and local maps were used in the study. Topographic surveys made especially for this report consisted of centerline profiles at three studied damsites. Subsurface explorations, by borings, were made at two damsites. Surveys of flood damages were made after the flood of 1936, reviewed in detail in 1951 and 1952 for the NENYIAC report (see paragraph 4b), again following the March 1953 flood, and updated for this report. These reviews included field examinations and personal interviews with individuals and officials of industries and municipalities experiencing flood losses. Office studies consisted of hydrologic and hydraulic analyses, engineering studies, and estimates of quantities and cost of construction items.

b. Consultation with interested parties. Public hearings were held in Berlin, New Hampshire and Lewiston, Maine on 13 and 14 December 1960, respectively, at which time interested parties requested consideration of improvements in various areas in the basin. Subsequent public meetings, under the sponsorship of local and civic groups, have been held at which the proposed Pontook project, considered in this report, was discussed. Meetings have also been held with State, County and local officials and with private individuals.

c. Field reconnaissance. Field reconnaissance of the problem areas has been made by the Division Engineer and his representatives.

SECTION III - PRIOR REPORTS

4. PRIOR REPORTS

Development of the water resources of the basin has been considered in the following published reports:

a. "308" Report. A report dated 12 July 1929 and printed as House Document No. 646, 71st Congress, 3d Session, concluded that improvements for navigation, flood control, power development, and irrigation

in the Androscoggin River basin were not warranted at that time.

b. NENYIAC Report. This comprehensive report, prepared by the New England-New York Inter-Agency Committee, inventoried the resources of the New England-New York area and recommended a master plan to be used as a guide for regional planning, development, conservation, and use of land, water, and related resources. Chapter VII of Part Two covers the Androscoggin River basin. Section VI of Chapter VII reported investigations for flood control and found that, under the criteria adopted for the report, the provision of storage for flood control in single or multiple-purpose reservoirs would not be warranted at that time. In Section VII, the undeveloped hydroelectric power potential of the basin was evaluated and a plan presented consisting of seven hydroelectric developments. The report was submitted to the President of the United States by the Secretary of the Army on 27 April 1956. Part I and Chapter 1 of Part 2 were printed as Senate Document No. 14, 85th Congress, 1st Session.

SECTION IV - DESCRIPTION

5. LOCATION AND EXTENT

The Androscoggin River basin is located in the southwestern part of Maine and the northeastern part of New Hampshire. It extends from the Canadian border at the boundary between the state of Maine and New Hampshire to 8 miles below tidewater at Brunswick, Maine. The basin has a length of about 110 miles and a width of about 65 miles and covers an area of 3,450 square miles, of which 2,730 are in Maine and 720 are in New Hampshire. A map of the basin is shown on Plate No. 1.

6. TOPOGRAPHY AND GEOLOGY

The Upper Androscoggin Basin lies mostly within the White Mountain Section of the New England Physiographic Province. The river has its source from the high watershed on the west central border of Maine and from the northeast portion of New Hampshire north of the Presidential Range. The mountainous terrain is broken by several relatively wide stream valleys and, locally, there are large basins occupied by great lakes such as the Rangeleys and others that are connected to discharge to the Androscoggin.

Prior to glaciation, the topography was in a mature stage of erosion with a network of sharply incised stream valleys having

The White Mountains in New Hampshire
showing part of the Presidential Range

graded profiles. Lakes and swamps did not exist and the overburden was the product of weathering of the bedrock. Glaciation modified this topography by erosion and deposition and disrupted the drainage system. There are evidences that the present circuitous, south and easterly course of the Androscoggin River is altered from a pre-glacial drainage westward to the Connecticut River Valley.

Glacial till, a mass mixture of soil and rock debris of all sizes scraped up and transported by the ice, variably blankets the bedrock surface throughout most of the Upper Basin. The till is thin or absent at high elevations and of considerable thicknesses on lower hill slopes and in the valley sections. Overlying the till in the valleys and in local basins are sorted deposits of glacial materials that were outwashed from the ice by meltwaters and deposited as sand and gravel terraces and plains.

The bedrocks of the basin, except for an area of relatively young slates and volcanics near the Rangeley Lakes, are very old sediments that have been metamorphosed to schist, gneiss and quartzite. These rocks have been much folded to a general northeasterly trend of structure and are frequently cut by igneous intrusions of a mainly granitic composition.

The pegmatites (coarse-grained granites) of the basin are a source of marketable minerals, principally feldspar, mica, and beryl with subordinate occurrences of rare minerals and minerals of gem quality. Principal production has been from the Rumford-Newry area at several intermittently operated mines and quarries, none of which are affected by reservoir plans. The glacial sands and gravel deposits, occurring as terraces and plains in the major valleys, are the only resources of a mineral nature that would be affected by reservoir construction.

Screw Auger Falls in Grafton Notch, Maine
A scenic attraction close to State Route 26

7. STREAM CHARACTERISTICS

a. Main Stream. The Androscoggin River proper starts at Errol Dam at the outlet of Umbagog Lake in the town of Errol, New Hampshire, although its principal headwater tributaries rise about 50 miles north of the lake. The main stem is 169 miles long between Errol Dam and its mouth in Merrymeeting Bay - 8 miles below the head of tidewater at Brunswick - descending a total of 1,245 feet in the 161 miles above tidewater. It has two steep drops, 240 feet in 2.5 miles at Berlin, New Hampshire and 180 feet in 1.6 miles at Rumford, Maine. Of the 1,094-foot fall on the main stem of the river between the Sawmill Dam in Berlin and Brunswick, 789 feet has been developed for hydroelectric power purposes.

b. Tributaries. As shown on Plate 1, there are a large number of tributaries to the Androscoggin River, many of which are a source of high runoff during periods of intensive rains, snowmelt, or a combination of both.

8. AREA MAPS

The Androscoggin River and its watershed are shown on quadrangle sheets of the U. S. Geological Survey at a scale of 1:62,500.

9. WEATHER AND FLOODS

In general, the climate of the basin is characterized by relatively cool summers and long, cold, snowy winters, especially in the inland areas. The average annual temperature is about 43°F and ranges from 45°F at points near the coast to below 40°F in the headwaters. Extremes in temperature range from occasional highs slightly in excess of 100°F to infrequent lows below minus 30°F. The frost-free period varies from 110 days in the higher portions of the basin to 160 days near the coast. Lying in the path of the "prevailing westerlies", which often include cyclonic disturbances that approach from the west and southwest, the basin is subject to frequent but short periods of heavy precipitation. The basin is also exposed to occasional coastal storms, some of tropical origin, that travel up the Atlantic seaboard.

The mean annual precipitation over the basin is about 40 inches, distributed rather uniformly throughout the year. It varies from below 35 inches in the headwater lakes area to over 60 inches in the White Mountains at the southwestern edge of the basin. Much of the winter

precipitation comes in the form of snow. With an annual snowfall that varies from 80 inches near the coast to 170 inches in the headwaters, it can be expected that the water content of the snow cover, nearly every spring, will amount to 6 to 8 inches over the entire basin, with 10 inches or more in the higher elevations of the White Mountains.

Major floods are caused principally by a combination of heavy rainfall and melting snow in the spring of the year. The three largest floods of record since 1892 occurred in the spring - in March 1936, April 1895, and March 1953. Major floods in the same period attributable to heavy rainfall alone were experienced in October 1959 and November 1927.

SECTION V - ECONOMIC DEVELOPMENT

10. POPULATION

The basin encompasses all or parts of 59 towns, 5 plantations and 2 cities in Maine, and 11 towns, 14 unincorporated places, and one city in New Hampshire. The estimated population of the basin, based on the 1960 Census, has increased about 6 percent in the past 10 years, and numbers 167,000, of which 145,000 are in Maine and 22,000 are in New Hampshire.

The distribution of the population, as defined in the 1960 Census, is 67 percent urban and 33 percent rural, with all of the urban population concentrated in two cities and portions of 6 towns in Maine and one city in New Hampshire. Urban areas and other places having populations in excess of 5,000 are listed in Table 1.

TABLE 1

POPULATION - ANDROSCOGGIN RIVER BASIN

MAJOR URBAN AREAS

Town and State	1960 Population
Lewiston, Maine	40,804
Auburn, Maine	24,449
Berlin, N. H.	17,821
Brunswick, Maine	15,797
Rumford, Maine	10,005
Mexico, Maine	5,043
Lisbon, Maine	5,042

11. TRANSPORTATION

The transportation pattern in the basin reflects the distribution of population. The more populous southern and central portions of the basin are served by a network of highways, while the thinly populated northern area has fewer roads. The main highways are U. S. Nos. 1, 2, I-95 and 202, and States Routes Nos. 4, 5, 16, 17 and 26, and the Maine Turnpike which facilitates travel within the basin by automobile and bus. Freight service is provided by the Maine Central Railroad which serves the towns in the eastern portion of the basin, the Canadian National Railroad (Grand Trunk) which crosses the watershed from Portland, Maine, to Berlin, New Hampshire, and the Boston and Maine Railroad which connects Berlin with Whitefield, New Hampshire. Two commercial and one military airfield and 9 small airports are located within or adjacent to the basin. The Androscoggin River, considered a navigable stream, has not been improved for commercial navigation, other than for transportation of logs.

12. MANUFACTURING

Manufacturing is of great importance to the economy of the basin, with about two-thirds of the towns engaging in manufacturing to some extent. The largest of the manufacturing centers are located along the main stem of the Androscoggin River, and provide employment to about 26,000 of the estimated 32,000 manufacturing workers in the

basin. Over 65 percent of the 26,000 employees work in the manufacturing centers located in the lower reach of the river.

The more important manufacturing centers in the basin and their principal products are: Auburn and Lewiston with the greatest concentration of shoe and textile mills in the State, other products being electronic elements, sheet metal, printing, bricks, lumber products, baking and canned foods; Berlin - pump, paper and allied products, athletic footwear, knit goods, and foundries; Brunswick - canned foods, shoes, brushes and lumber products; and Rumford - paper and paper products. In the Maine section of the basin, the value of products produced in 1962 was $295,700,000 with 21,000 workers receiving $81,188,000 in wages. This reflects an increase since 1957 of 16% in output, 14% in wages paid with practically no change in number of wage earners. Expenditure for plant improvement in Androscoggin County, Maine was $6.6 million in 1962, about $2\frac{1}{4}$ times the expenditure for 1957.

Contour-planted potatoes on farm land near Auburn, Maine

13. AGRICULTURE

About 20 percent of the basin is in farm land with much of the farm land devoted to wood lots. The suitability of land for agricultural crop purposes varies throughout the basin. The mountainous upper area in New Hampshire and Maine consists of relatively wide major valleys with many lakes and swamps, with the few part-time farms scattered through the southern fringe of the area. The central portion of the basin, a hilly plateau with hills generally rising to elevations of 1,000 to 2,000 feet above sea level, is predominantly dairy area. The lower section of the basin, with broadly rolling hills rising to elevations of 500 to 600 feet above mean sea level, and the Rangeley Lake area, is well suited for all farm crops. Near the coast, truck farming on sandy soil near large centers of populations is the major agricultural activity. Many of the farms include dairy enterprises with the primary source of farm income from dairy products and poultry. Other farm income is from livestock, field crops, vegetables, fruits and nuts, horticultural specialties, and forest products. In 1963, farm income in Maine totalled $64 million.

14. WATER SUPPLY

An abundance of water exists in the basin from the 438 miles of streams with safe yields in excess of one million gallons per day, the many miles of streams with significant yields of less than one million gallons per day, and the many lakes and ponds in the region. The minimum mean monthly flow at Brunswick, Maine is about 1,143 million gallons per day. Although there are about 320 miles of streams receiving significant pollution, the quantity of water available at the present time exceeds the foreseeable future water demands. At the present time, no municipal water supplies are taken directly from the Androscoggin River between Berlin, New Hampshire and Merry-meeting Bay, Maine.

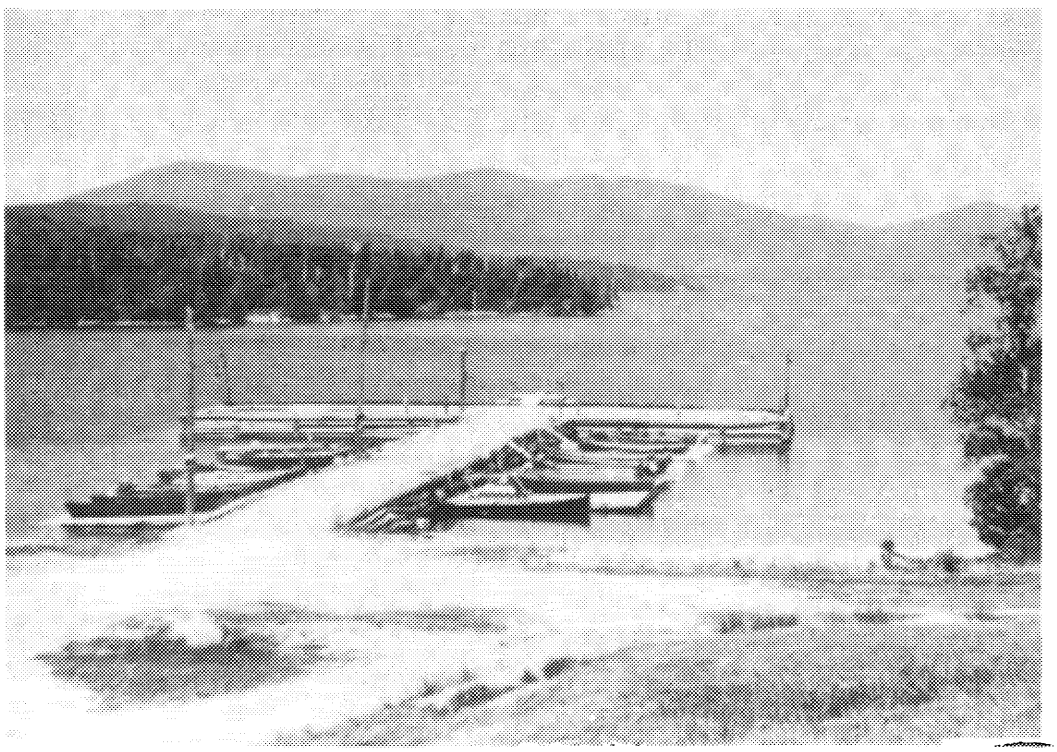
15. HYDROELECTRIC POWER

There are 31 existing hydroelectric plants in the basin with a total installed capacity of 161,771 kilowatts. Thirteen of these plants are operated by public utilities and develop 84,943 kilowatts, with the remaining 18 plants owned by industrial concerns with a total capacity of 76,828 kilowatts. Electrical energy in the Maine portion of the basin is marketed principally by the Central Maine Power Company; in the New Hampshire area, electrical service is supplied by the Public

Service Company of New Hampshire. Each company's transmission is interconnected with neighboring utilities for interchange purposes.

16. RECREATION

While manufacturing, lumbering, and retailing are the principal occupations throughout the basin, income from recreation is an important factor in the economy of the New Hampshire area and the Maine portion of the basin above Rumford. The scenic environment, numerous lakes, and cool climate attract great numbers of visitors during the summer months. The high quality of fishing and abundant wildlife account for considerable sportsman use during the spring and fall seasons. In the southern half, where the majority of the residents of the basin live, there are few developed public recreational facilities.



Boat landing on Kennebago Lake
West Kennebago Mountain in the distance

17. FORESTRY

More than 80 percent of the land area of the basin is forested. It provides raw material for the wood-using industries in the valley and supports directly or indirectly about one-fourth of the population of the basin. Most of the forest land, except in mountainous areas, is of

good quality and produces commercially valuable species of timber such as spruce, fir, pine, beech, and birch. Large holdings of forest lands are managed for sustained yields.

18. MINERALS

Various mineral deposits are found in the Androscoggin River basin, the most important being sand, gravel, and pegmatite. Data are not available on the total production of sand and gravel but the output based on 10 producers exceeds that of any other mineral commodity in tonnage and value in the basin. Pegmatite materials, found in the middle and southern part of the basin, are mined for feldspar, beryl, and mica, these sources accounting for most of the output of these materials in the state of Maine. Other mineral commodities commercially utilized in the basin are: clay for paper and allied products, ceramic and brick; granite for building material; and peat for agricultural purposes. Estimated reserves of air-dried peat are believed to be about 2,000,000 tons.

SECTION VI - EXTENT AND CHARACTER OF FLOODED AREA

19. GENERAL

Stretches of the Androscoggin's main valley on both sides of the river are subject to flooding in the lower 130-mile length of the river below Berlin. The relatively steep slope of the stream combined with the topography of the valley precludes extensive areal flooding; however, the areas subject to inundation are moderately well developed. A substantial portion of the basin's industrial complex is located in the flood plain as well as key segments of its transportation network and public utilities. Residential and commercial properties in the larger communities along the stream are also flood-prone, particularly in Rumford, Mexico, Lewiston and Auburn in Maine and in Gorham, New Hampshire. Agriculture, a declining segment in the valley's economy, suffers only minor losses. Manufacturing, the largest source of employment in the basin, suffers most from flooding. Mainly oriented toward paper making, the area's industry also produces textiles, leather products and gypsum products.

SECTION VII - FLOOD DAMAGES

20. EXPERIENCED FLOOD DAMAGES

The record flood of March 1936 caused damages estimated at $4,392,000 and completely disrupted the normal economy of the basin.

Four lives were lost and 1,500 families were made temporarily homeless. Communication in the valley and with the outside world was practically cut off as eighteen bridges were destroyed, rail and road facilities were extensively damaged and telephone and telegraph facilities were severed. Some of the valley towns were without power and water. Over 40 percent of the damages were to industry, 20 percent were to urban properties and the rest to highways, railroad and utilities. All but $160,000 of the losses were in the State of Maine. The second greatest flow at the Rumford gage was recorded in April 1895; however, no damage information is available on this flood. The third largest recorded flood in the Androscoggin River basin occurred in March 1953. Total damages in the 1953 flood were estimated at $2,230,000. Significant areas of damage in this flood occurred along the main river from Berlin to Brunswick, and on three of the tributary streams, the Dead River in New Hampshire and the Swift and Little Androscoggin Rivers in Maine. Industrial losses represented the largest single item of loss, almost 40 percent, with other principal losses occurring to urban (residential and commercial), public utilities, and the transportation network. In Mexico, at the junction of the Swift River and the main stem of the Androscoggin, 100 families evacuated their homes and the entire business section of the town was closed as the Swift River overflowed Main Street.

21. RECURRING LOSSES

Based on a recent field review of potential losses in the Androscoggin River valley, a recurrence of the record flood of March 1936, under current economic conditions, would cause losses estimated at $12,500,000 along the main stem of the river from the Sawmill Dam in upper Berlin to tidewater at Brunswick. Twenty industrial complexes, employing over 9,000 people, would suffer the major share of the damages, 65 percent of the total estimated loss. Pulp and paper product manufacturers at Berlin and at Rumford, Jay, Livermore Falls and Topsham, Maine as well as textile plants at Lewiston, Lisbon Falls and Brunswick, Maine would be hardest hit.

22. AVERAGE ANNUAL LOSSES

Recurring losses for various stages of flooding were converted to average annual losses by correlation between stage-discharge and discharge-frequency relationships in each of 15 damage reaches of the main river. Average annual losses on the main stem amount to $671,000 under current economic conditions, and $751,000 after adjustment for expected growth.

23. TRENDS OF DEVELOPMENT

The Androscoggin River basin has a stable, relatively prosperous economy. Back-boned by the paper making industry, the basin in Maine is a highly industrialized portion of the state. The section of the river in New Hampshire below the Sawmill Dam at Berlin has an economy geared to one large paper company. Based on past and current economic development in the basin, an overall economic growth rate of 0.75 percent annually over the next 50 years is considered probable in the Maine portion of the basin with a leveling off trend probable for the 50-year period thereafter. In New Hampshire, while little growth is expected, the progressive policies of the one company which governs industry in the area makes it unlikely that there will be any decline in the area's economy in the future.

24. FUTURE ANNUAL LOSSES

Flood damages in the Maine portion of the basin can be expected to increase at least as fast as the overall economic growth rate. On an average annual equivalent basis, losses will be increased by 1.8 percent in the reaches from Rumford to tidewater at Brunswick. Average annual losses over the life of the project under future conditions amount to ~~$751,000~~ 750,000 at 1964 price levels.

SECTION VIII - IMPROVEMENTS BY FEDERAL AND NON-FEDERAL AGENCIES

25. EXISTING IMPROVEMENTS BY FEDERAL AGENCIES

No Federal agencies have constructed any projects for flood control or other beneficial use of water in the basin.

26. PROPOSED IMPROVEMENTS BY OTHER FEDERAL AGENCIES

The Soil Conservation Service, United States Department of Agriculture, pursuant to authority contained in the Watershed Protection and Flood Prevention Act under Public Law 566, is investigating flood-water retarding facilities in the Dead River watershed in New Hampshire and in the Nezinscot River watershed in Maine. Projects under consideration include small earth-fill retarding structures with self-regulating outlet works and grassed spillways, and channel improvements.

Correction phoned to Slagle 30/8/65

27. IMPROVEMENTS BY NON-FEDERAL AGENCIES

The river has been highly developed by private interests for storage and power production. Existing flood control improvements in the basin are of a limited local nature. Local interests, in some instances with State assistance, have provided various types of flood prevention works in their community. In Gorham, the channels of the Moose and Peabody Rivers were cleared of boulders and the boulders utilized in dikes. A short section of earth dike was also constructed adjacent to the south bank of the Androscoggin River. In Rumford, a bridge was lengthened to increase its waterway, an overflow-type dam was modified to increase its discharge capacities, a dike was constructed between the Oxford Paper Company properties and the Androscoggin River, and a short wall was constructed by the Works Progress Administration to protect a section of road on the right bank of the Androscoggin river upstream of Rumford.

The Weather Bureau office at Portland, Maine issues general warnings of degree of flooding to Rumford and Lewiston whenever flood stage is anticipated. Also, during the period of flood hazard in the spring, the Weather Bureau issues bulletins evaluating existing flood potential in the state of Maine for distribution to news media.

The Union Water Power Company of Lewiston, which controls flows from the many large lakes above Errol Dam, is also a source of information on estimated high river stages.

Boundaries of areas vulnerable to flooding have been established by the city of Auburn. Ordinances regulate and restrict the location, construction and use of buildings and land in these areas. In Rumford, voters refused to adopt a similar zoning law.

SECTION IX - IMPROVEMENTS DESIRED

28. PUBLIC HEARINGS

To obtain the views of those interested in water resource development in the Androscoggin River basin, public hearings were held in Berlin, New Hampshire and Lewiston, Maine on 13 and 14 December 1960, respectively. Approximately 50 people attended each hearing including representatives of Federal, State, and local governments, industrial establishments, civic organizations, and interested individuals.

29. BERLIN HEARING

The Mayor of Berlin briefly described the damage to the city from past floods on the Dead River.

Representatives of Gorham requested a flood control dam for the Peabody River and diversion of floodwaters from the Moose River into Moose Brook. A flood control dam and reservoir with recreational facilities on the Moose River was suggested by representatives of Randolph. Other individuals requested the dredging and removal of debris from the Androscoggin River, upstream of Shelburne, and restoration of the existing deteriorated wood dam at Pontook Reservoir.

30. LEWISTON HEARING

Several persons including representatives of local governments requested that regulation of water for pollution abatement be considered in the study of the resources of the basin. Representatives of Rumford and Wayne cited damage from past floods to their communities and contiguous areas. A representative of Rumford also suggested the diversion of floodwaters into Wyman Brook, below the community. A representative of Wayne requested the construction of a dam on the Dead River to prevent floodwaters and seasonal high waters on the Androscoggin River from flowing back into Androscoggin Lake. Representatives of several industrial establishments briefly described the facilities they use to reduce the discharge of pollutants into the river. A representative of the League of Women Voters of Maine urged maximum use of resources in the basin for power development, flood control, water supply, irrigation, recreation, and stream regulation.

SECTION X - FLOOD PROBLEMS, RELATED PROBLEMS AND SOLUTIONS CONSIDERED

31. FLOOD PROBLEMS

Destructive floods in the basin are caused principally by a combination of heavy rainfall and melting snow. Nearly every spring melting snow alone produces high flows on the rivers. Although most of the major floods occur in the spring, they have occurred at other times of the year. A contributing factor in the development of damaging downstream floods is the rapidity of runoff from the many tributaries located in the mountainous areas below Errol. In almost every community, rural buildings and land, and transportation facilities located

along the streams have suffered damaging effects from floods.

32. RELATED PROBLEMS

a. General. In addition to periods of great surplus of water, the basin is subject to periods of low stream flow. Improvement in the distribution of flows offers present and future opportunities for meeting other water needs and water-oriented purposes such as water supply, pollution abatement, hydroelectric power, and recreation. These water resource problems are discussed in the following paragraphs.

b. Water Supply. At the present time, no municipal water supplies are taken directly from the Androscoggin River. About 70 percent of the people served by municipal systems along the waterway utilize surface supplies from tributary streams, while the remaining 30 percent obtain their supplies from ground sources or combination of ground and surface sources.

At present Rumford and Mexico are seeking sources of additional water supply for domestic and industrial use. This demand could be met through development of storage in the studied Hale Reservoir on the Swift River. The Water District has indicated that it is not interested in this source of supply and will investigate other areas for possible future development of a reservoir or wells.

The Brunswick-Topsham Water District indicated it would be interested in considering water supply together with flood control as a joint venture with the Federal government but no feasible project was found in the vicinity.

c. Hydroelectric Power. In the period between 1950 and 1960, the combined requirements of the entire system of the Public Service Company of New Hampshire and the Central Maine Power Company of Maine, which serve the basin, have increased about 1.8 times. The Federal Power Commission forecasts that this increase would be about 2.4 times by 1965. In view of the current magnitude of the power requirements and its expected continued growth, the development of hydroelectric power was considered in conjunction with the flood control studies for this report. Studies by the Commission indicate that the hydroelectric power which could be developed at any of the studied projects could be readily and effectively absorbed as soon as available.

d. Recreation. Studies made by the National Park Service and the Bureau of Outdoor Recreation show that a need presently exists in the basin for the development of additional water-oriented recreational facilities, and that this need will expand in the future. The New Hampshire Department of Resources and Economic Development has expressed the belief that the Pontook Project has an excellent potential for the development of outdoor recreation facilities.

Typical trout stream, Bear River at Newry, Maine

e. Water Quality. The Androscoggin River has long been a center of manufacturing activity. The stream was attractive for development of power and the bountiful forests nearby led to the establishment of pulp and paper manufacturing. The waste products from the manufacturing processes have been passed into the river for many years. As industry and population expanded, the use of the river for waste disposal created nuisance conditions. During the summer months of 1940, 1941, and 1942 particularly obnoxious conditions existed due to the pollutional load in the river. Public demand for improvement of the stream resulted in a continuing program to regulate pollution of the Androscoggin by the States and industry. The program has been conducted under a series of decrees by the Supreme Judicial Court of

Equity for Androscoggin County, Maine. The decrees have required the controlled discharge of sulfite waste liquors, the maintenance of a sampling and analysis program during the summer months by industry, and the construction of certain control facilities. Requirements of the Court decrees have been supervised by a court-appointed administrator since 1948.

The controls placed on industry have been aimed at the prevention of a public nuisance while permitting use of the river as a means of disposing of industrial waste and municipal sewage. Reports indicate that the controls have succeeded in removing some of the undesirable results of gross pollution.

Although the condition of the river has improved since 1940, analysis of data for the summer months of 1961, obtained from the offices of the Attorney General of Maine by the Public Health Service of the Department of Health, Education, and Welfare indicates the Androscoggin River remains highly polluted. The pollution assimilation capacity of the river is so utilized that the quality is maintained at a level that will just prevent the development of obnoxious odors.

In view of this condition, the regional office of the U. S. Public Health Service has informally noted that storage of water for water quality improvement at this time would in effect be a substitute for waste treatment and contrary to the provisions of the present Federal Water Pollution Control Act. For this reason, storage for low flow regulation for water quality improvement was not included in studied projects.

The Service is presently studying the need for and the value of water storage for water quality control in the Androscoggin basin. These studies are being made under the assumption that adequate waste treatment will be installed by industries and municipalities. Due to the complexities of the pollution problem, the Service has not completed their evaluation at this time. Some of the complexities involved are the changing nature of the pulp and paper manufacturing processes, the unpredictable expansion of this industry, and the varying conditions of the river due to changes in temperature, flow, and waste loadings.

When and if the Service determines a need for storage for water quality control, consideration will be given to modifying the operation of the recommended Pontook project in the interest of water quality improvement. However, before any such modification would be

implemented, adequate treatment at the sources of pollution would have to have been accomplished.

f. Comprehensive Planning. In the formulation of water resource development plans, consideration was given to all potential reservoir sites in the basin and those which showed promise of feasibility were studied in detail. The potential hydroelectric power projects in the comprehensive basin plan developed by the New England-New York Inter-Agency Committee in 1955 (see paragraph 4b) were re-examined. In the development of plans for reservoir projects, all possible uses were carefully considered to insure that the full economic potentialities as well as the social values of the site were fully and properly utilized. No particular use was favored at the expense of other uses and the plan ultimately adopted is designed to provide the greatest overall benefits to the region as a whole. The Pontook project considered in this report is basically one of the seven projects discussed in the New England-New York Inter-Agency report. The project will fit into any comprehensive basin plan undertaken in cooperation with other Federal and local agencies as required by law, interagency agreement, and administrative policy. Plate No. 1 shows the location of the various projects studied for this report.

33. SOLUTIONS CONSIDERED

a. Object. The object of this investigation was the development of an economic plan of water resource improvement which would alleviate the flood problem and other related water resource problems of the basin. This study evaluated the needs for water conservation, water quality control, water supply, fish and wildlife conservation, recreation, and hydroelectric power, and develops a plan of improvement to meet these needs insofar as economically feasible.

Detailed investigations and analyses of potential flood improvement projects made during prior basin studies were reviewed. The more favorable sites of improvements considered were up-dated in design, with allied water uses incorporated in the reservoir projects where feasible, and re-evaluated at present-day construction costs and valley conditions to determine their economic feasibility at this time. Prior studies indicated the most feasible methods of solving the flood problems to be control by reservoirs. The current study confirms this finding with the modification that future expansion in the basin economy may make it desirable to augment reservoir control with channel improvements and protective works for specific damage

areas. A description of the Pontook multiple-purpose project is given in Section XI. Other projects studied are briefly noted in the following sub-paragraphs.

b. Reservoir Sites. Over 50 reservoir sites were investigated for this report. Of these, 30 were considered worthy of a preliminary cost analysis. Based upon the data acquired from this analysis, it was found that 11 reservoir sites should be further studied. Of these 11 sites, Pontook on the Androscoggin River, Ellis on the Ellis River, and Hale on the Swift River were found to warrant detailed study and, of these, only the Pontook project was found to provide for the immediate needs of the area. Attention was also given to flood prevention and other projects requested at the hearings but none was found to be economically justified at this time.

c. Local Protection. Local protection works were considered for the communities in which flood damages were confined to a reasonably concentrated area. Nine communities - Berlin and Gorham, New Hampshire, and Rumford, Mexico, Lewiston, Auburn, Lisbon Falls, Topsham, and Brunswick, Maine, all located along the main stem of the Androscoggin River - and one community, Wayne, Maine on the shore of Androscoggin Lake, were studied in some detail. Protective works considered for the majority of the communities included dikes, floodwalls, and channel improvements and, where tributary streams contributed to the flood damages, upstream dams were also considered. At Wayne, consideration was given to a higher control structure on the Dead River at the outlet to Androscoggin Lake. At Rumford, consideration was also given to the diversion of floodwaters around the community. Studies of these projects indicate that none is economically justified at this time.

SECTION XI - PLAN OF IMPROVEMENT

34. GENERAL

Consideration was given to meeting the water resources needs insofar as possible through full development of the Pontook site. Hydroelectric power, recreation, fish and wildlife conservation, and flood control are included. Since the Pontook project is designed for peaking power purposes, releases from the turbines will be concentrated for short periods. This requires the construction of a downstream reservoir to reregulate the flows to enable efficient use of the water at downstream locations. The proximity of the main reservoir

to the reregulating pool indicates the possibility of a pumped storage project. The use of reversible power units will be considered during design stage in compliance with a suggestion of the Federal Power Commission.

35. CONSTRUCTION FEATURES

The principal features of construction for the Pontook project will consist of a main dam, located in the upper reach of the Androscoggin River, 151 miles above its mouth, in the town of Dummer, and a reregulating dam, located approximately 3.5 miles downstream of the main structure, in the town of Milan. Since 661,000 acre-feet of storage above the Errol Dam (about 18 miles above the Pontook main dam) is controlled by private interests to regulate flow at Berlin, necessary discharge control facilities will be provided in the reregulating dam to stabilize the fluctuating flows from the peaking power plant at the main dam. In reregulating the discharge from the main dam, it was found that facilities for the generation of hydroelectric power could be provided at the reregulating dam. The sites selected for the construction of the dams are geologically and topographically suited for the proposed structures. General plans of the dams and appurtenant structures are shown on Plates 3, 4 and 5. Limits of the several pools and land required for the project are shown on Plate 2. A brief description of the project follows with pertinent data summarized in Table 2.

a. Description.

(1) Main Dam and Reservoir. The main dam, at full flood control pool elevation 1,220 mean sea level datum, will create a reservoir about 16 miles long with a surface area of 7,470 acres (about 11.7 square miles), impounding a gross capacity of 238,000 acre-feet. A lake approximately $13\frac{1}{2}$ miles long will be created by the maximum power pool at elevation 1,212 with a surface area of 6,500 acres (about 10 square miles). The reservoir will contain dead storage of 39,000 acre-feet below elevation 1,182; 141,000 acre-feet for power generation and flood control storage between elevation 1,182 and 1,212; and 58,000 acre-feet of storage reserved exclusively for flood control purposes between elevation 1,212 and 1,220. The exclusive flood control storage provided is equivalent to 6.4 inches of runoff from the net drainage area of 170 square miles below the dam at Errol. The limiting elevation of 1,220 feet is established by improvements in the town of Errol.

TABLE 2

PERTINENT DATA
PONTOOK PROJECT

	Main Dam	Reregulating Dam
Distance above mouth, miles	151	147.5
Drainage area, square miles		
Gross	1,215	1,224
Net	170	9
Dam		
Type	Rock fill	Rolled earth
Maximum height, feet	115	57
Length, feet	2,000	2,500
Top elevation, m.s.l.	1,239	1,141
Spillway		
Length, feet	485	155
Crest, elevation, m.s.l.	1,220	1,118
Gates, number and size		
Flood control	5-10'x10'	2-9'x4'
Penstock intake	6-13' x30'	1-22'x15'
Log sluice	1-6½'x32'	1-15'x9"
Water surface elevations, m.s.l.		
Maximum surcharge	1,234	1,138
Maximum flood control	1,220	---
Maximum power pool	1,212	1,118
Minimum power pool	1,182	1,112
Normal tail water	1,118	1,100
Surface areas, acres		
Flood control pool	7,470	---
Maximum power pool	6,500	690
Minimum power pool	2,950	530
Storage capacities, acre-feet		
Flood control, exclusive	58,000	0
Flood control & power	141,000	4,100
Dead	39,000	5,200
Total	238,000	9,300
Power installation		
Installed capacity, kw	2 @ 67,500	1 @ 3,000
Power head, net, feet		
Maximum	92	17
Average	82	14
Minimum	62	11
Maximum drawdown, feet	30	6
Regulated, min. dep. flow, c.f.s.	1,675	1,675
Min. obs. mean monthly flow, c.f.s.	1,014	---

The rock-fill dam will be approximately 2,000 feet long, 115 feet high at the river bed, with a top elevation of 1,239. A side channel spillway, with crest at elevation 1,220, and 485 feet long, capable of passing a peak discharge of 93,000 cubic feet per second with a surcharge of 14 feet, will be constructed in the east abutment of the dam. A flood control outlet structure, with five slide gates with sill at elevation 1,182, will be located between the weir and the dam embankment. In emptying the flood control pool, the gates will be regulated to release 12,000 cubic feet per second which is the capacity of the downstream river channel in Berlin. A powerhouse, with generating facilities consisting of two 67,500 kilowatt units, and producing an average of 107,000,000 kilowatt-hours annually at a capacity factor of 9.0 percent, will be located at the downstream toe of the dam. A penstock intake structure, with 6 service gates, at the upstream toe of the dam will supply two 32-foot diameter penstocks leading to the powerhouse, with a log sluice conduit adjacent to the penstocks. The maximum discharge from the two turbines will be 23,000 cubic feet per second. A rock-fill dike, approximately 1,120 feet long, having a maximum height of 39 feet, will close a saddle in the perimeter of the reservoir near the east abutment of the dam.

(2) Reregulating Dam and Pool. The reregulating dam will create a pool that will extend upstream to the main dam, have a surface area of 690 acres, and a gross capacity of 9,300 acre-feet at spillway crest elevation of 1,118. Pondage of 4,100 acre-feet, sufficient to reregulate releases from the main powerhouse, will be available in the pool between elevation 1,118 and 1,112.

The dam, with a top elevation of 1,141, will be of rolled earthfill construction, approximately 2,500 feet long, and a maximum height of 57 feet above the river bed. A fixed crest spillway, 155 feet long, with a discharge capacity of 50,000 cubic feet per second at a surcharge of 20 feet, and a gated outlet works with a power plant on the downstream face, will be constructed in the west abutment of the dam. Four gates will be provided in the outlet works, one each for the penstock and log sluiceway, and two for regulating the discharge from the pool. A single horizontal generating unit of 3,000 kilowatt capacity, which will produce an average annual output of 18,000,000 kilowatt-hours of energy at a capacity factor of 68.5 percent, will be provided in the power plant. The plant will have a dependable capacity of 2,000 KW, under minimum flow conditions, operating at an 85 percent load factor.

b. Recreation. The full power pool will provide a lake about 13½ miles long with a surface area of 6,500 acres. Normal operation of the power pool will result in a drawdown of one foot or less during the summer recreation season, thus preserving its attractiveness for recreational pursuits. Consistent with public safety and operation of the project, the entire periphery of the reservoir and adjacent lands will be open to public use. Initial facilities will provide for such activities as swimming, picnicking, camping, boating, hunting, fishing, and other water-related uses. No recreational facilities will be provided for the pool or shore area of the reregulating reservoir since the pool surface will fluctuate from the sudden releases of large quantities of water at start of peak power generation at the main dam power plant. Safety measures will be incorporated in the design to control use of this reservoir area.

c. Relocations. Construction of the Pontook project will necessitate relocation of about 13½ miles of Route 16 and about one mile of a 115 KV transmission line in the reservoir of the main dam, and about 2 miles of a secondary road in the pool area of the reregulating dam. An existing privately-owned, single lane steel girder logging bridge, spanning the Androscoggin River, will also require reconstruction to an elevation above full flood pool in the reservoir. The final alignment of Route 16 will be determined through agreement with the State of New Hampshire. The existing Pontook crib type dam, located about one mile upstream of the main dam will not be removed since it will be covered by a minimum of 19 feet of water impounded for the power pool.

d. Real Estate Requirements.

(1) Main Dam. The land and improvements to be acquired in fee for all water resource project purposes, estimated at 10,000 acres, consists of an area bounded by a "guide taking line" located 300 feet horizontally beyond the edge of the full flood control pool and also includes the area required for the construction of the dam, dike, and appurtenant structures, and the relocation of Route 16 and transmission line. An additional 12,100 acres of land abutting or adjacent to the reservoir guide taking line would be taken in fee specifically for general recreation and for fish and wildlife loss mitigation.

(2) Reregulating Dam. Approximately 800 acres of land will be acquired in fee for the damsite, reservoir, and the relocation of a secondary road, and about 100 acres for a 100-foot strip of land on each bank of the Androscoggin River from the dam downstream to the vicinity of the Berlin Municipal Airport (about 5 miles) to provide public access to the river for sports fishery.

36. METHOD OF OPERATION

The Pontook project will normally be operated as a peaking power plant as required by load demands on the system. The 141,000 acre-feet of power storage at Pontook will be operated in conjunction with the 661,000 acre-feet of storage in the existing Rangeley Lakes system for optimum use for flood control, power, and recreation. Except in times of flood, the 58,000 acre-feet of storage space reserved exclusively for flood control will be held inviolate. A system rule curve of operation was developed whereby the system storage would be drawn down in late winter to provide additional storage space during the snow melt period, thereby increasing the flood control effectiveness of the project. The rule curve would also provide for maximum storage at Pontook during the summer months in order to present a relatively stable lake level during the recreation season. During periods of incipient or actual flood conditions downstream, flood control regulation will become dominant. After passage of the flood or flood threat, the stored flood waters will be released as rapidly as possible, usually through the turbines, consistent with downstream channel capacities and stages. Normal operations will resume as the flood recedes. The primary function of the reregulating dam is to store and reregulate the high flows from the peaking power plant at the main dam. The entire project will be operated in accordance with regulating procedures that will best utilize the available water.

37. DEGREE OF PROTECTION

Table 3 indicates the effect that the Pontook Reservoir would have in reducing flood stages at various points along the Androscoggin River during a flood similar to the largest flood of record in the basin, that of March 1936.

TABLE 3

MARCH 1936 FLOOD
EFFECT OF PONTOOK RESERVOIR REGULATION
AND REREGULATION OF UPSTREAM STORAGE RESERVOIRS

Location	Observed (c.f.s.)	Modified (c.f.s.)	Reduction (c.f.s.)	Reduction (%)
Pontook Dam	16,000	8,000(1)	8,000	50.0
Berlin, N. H.	19,900	12,000(2)	7,900	39.6
Rumford, Maine	74,000	66,500	7,500	10.1
Auburn, Maine	118,000	113,000	5,000	4.2

(1) During development of flood, outflow curtailed to power requirements of 1,675 c.f.s. or less.

(2) During development of flood, with flow from Pontook curtailed to 1,675 c.f.s., flow at Berlin would be 9,000 c.f.s. Flow would be increased to 12,000 c.f.s. (safe channel capacity) after flood crest has passed downstream damage centers.

SECTION XII - ESTIMATES OF FIRST COSTS AND ANNUAL CHARGES

38. FIRST COSTS

Unit prices used in estimating construction and relocation costs in this report are based on average bid prices for similar work in the same general region, adjusted to 1964 price level. Costs of electrical, mechanical and hydraulic equipment was obtained from published prices and consultations with manufacturers. Valuations of property are based on surveys at the project site, including information from local officials on recent sales in the area. Included in the costs is a contingency allowance which also provides for minor items of work not in the specific items of the estimates. The costs for engineering and overhead are based on knowledge of the site and experience on similar projects. The total investment includes interest during construction at the rate of 3-1/8 percent for one-half the estimated construction period of four years and the present worth of recreation facilities to be added in the future as usage grows. For purposes of this report, it was estimated that additional recreation facilities would be added at five year intervals throughout the life of the project, for a total cost of future recreation facilities of $1,200,000.

39. ANNUAL CHARGES

Annual charges are based on an annual interest rate of 3-1/8 percent for Federal financial costs with amortization of the project cost distributed over a 100-year period. Allowances are made for maintenance, operation and major replacement costs and for tax loss on lands transferred to Federal ownership.

40. COST ESTIMATE

Estimates of first costs and annual charges for the Pontook project are given in Table 4.

SECTION XIII - ANNUAL BENEFITS

41. FLOOD PREVENTION BENEFITS

Flood damage prevention benefits were derived as the difference between annual losses expected in the basin under projected conditions over the next hundred years and those remaining after construction of the Pontook project. Benefits for flood reductions between Berlin and tidewater at Brunswick credited to the project amount to $204,000 annually.

Important intangible benefits on which a monetary value cannot be placed would also be realized as a result of the proposed project. The reservoir, through reduction in flood stages and durations, would increase the safety and well being of the population of the area affected by reducing the hazard of possible loss of life, and increasing the overall security of the downstream areas.

42. HYDROELECTRIC POWER BENEFITS

Hydroelectric power benefits are based on the equivalent cost of providing power by the most likely alternate source which, in this study, is considered to be a privately-financed steam plant to serve the same market area. Power values were derived by the Federal Power Commission on the following basis:

(1) Based on past and expected growth in the power market area to be served by the proposed project, the output of the proposed installation could be readily and effectively absorbed as soon as available.

TABLE 4

COST SUMMARY - PONTOOK PROJECT
(1964 Price Level)

FIRST COSTS

Lands and Damages	$ 1,900,000
Relocations	4,570,000
Reservoir Clearing	2,700,000
Dam	12,945,000
Fish and Wildlife Facilities	165,000
Power Plant	26,805,000
Recreation Facilities	850,000
Buildings, Grounds and Utilities	130,000
Permanent Operating Equipment	35,000
Engineering & Design	2,600,000
Supervision & Administration	3,300,000
TOTAL INITIAL FIRST COST	$ 56,000,000
Future Additions for Recreation	1,200,000
TOTAL PROJECT FIRST COST	$ 57,200,000

INVESTMENT COSTS

First Cost	$ 56,000,000
Interest during construction	3,500,000
Present worth of future additions for recreation	405,000
TOTAL PROJECT INVESTMENT	$ 59,905,000

ANNUAL CHARGES

Interest	$ 1,872,000
Amortization	90,000
Maintenance & Operation	333,000
Major replacements	93,000
TOTAL FINANCIAL ANNUAL CHARGES	$ 2,388,000
Loss of taxes on land	38,000
TOTAL ECONOMIC ANNUAL CHARGES	$ 2,426,000

(2) Values of $23.40 per kilowatt of dependable capacity and 2.4 mills per kilowatt-hour for energy at the high tension side of the project step-up substation were based on production costs of a comparable, privately-financed steam plant and associated transmission facilities and Federally-financed project transmission facilities. In testing for economic feasibility of adding hydroelectric power to the project, the separable costs of such addition were compared with the costs of a comparable Federally-financed steam plant. In this latter instance, values of $9.60 per kilowatt and 2.4 mills per kilowatt-hour were also derived by the Commission which noted, in furnishing these values, that it considers it unrealistic to evaluate power developments at the Pontook projects using Federally-financed steam-electric sources of power as the basis for comparison.

(3) A value of 4 mills per kilowatt-hour was determined as the value of increased energy produced at existing power plants downstream of the project as a result of the additional flow from the Pontook reservoir.

Based on the above values, power benefits to the Pontook project are computed as follows:

Dependable capacity - 137,000 KW @ $23.40	=	$3,206,000
Interruptible capacity - $\frac{1}{2}$ x 1,000 KW @ $23.40	=	12,000
Energy at site - 125,000,000 KWH @ 0.0024	=	300,000
Increased energy at existing downstream projects - 19,000,000 KWH @ 0.0040	=	76,000
TOTAL POWER BENEFITS		$3,594,000

These benefits include only the output from the installation presently planned. During the detailed design stage, the Federal Power Commission will review the then-current and forecast area power market. Based on its findings, studies will be made to determine whether additional units should be installed at the time of construction or provisions made for additional units in the future.

43. GENERAL RECREATION BENEFITS

General recreation benefits will result from the development of the reservoir areas and contiguous land for public use. The annual visitation, upon completion of the recreational development, is estimated to be 110,000 visitor-days, with the annual visitation reaching 404,000 visitor-days by the end of the assumed 100-year project life. The

average annual benefits from these visitations are estimated to be $289,000. The State of New Hampshire, under the State Planning Project, is presently investigating demands and needs for outdoor recreation within the State. It may well be that the findings of this study, particularly in trends of non-resident use of recreation facilities, may increase the expected annual visitation and benefits with 6,500 acres of water area available for public use in an area of unsurpassed fishing potential, served by a modern highway system.

44. FISH AND WILDLIFE EFFECTS

An evaluation of the effect of the reservoir on fish and wildlife resources has been made by the U. S. Fish and Wildlife Service. The studies include the derivation of annual losses of fisherman-days of stream fishery as well as annual losses of hunter days for deer, upland game and waterfowl. Mitigating measures recommended by the Service include additional land taking for deer yards and stream fisheries, and construction of parking areas, shallow depth water impoundments for waterfowl, and boat launching ramps. Total costs for these mitigating measures are estimated at $800,000. The Service also recommends inclusion of provisions for future construction of fish passage facilities at both dams and for mechanical aeration of releases from the regulating dam. The Division Engineer considers that construction of fish passage facilities may be accomplished, when needed, without specific provisions being made during initial construction for so doing. Means for satisfactorily aerating water are not known at this time. Should a method be developed prior to construction, it will be included during design of the project. There are no monetary benefits to be added to or subtracted from the project since these mitigating measures would only offset the losses to fish and wildlife resources caused by the project.

45. REDEVELOPMENT BENEFITS

The construction of the Pontook project will produce significant economic benefits in the region centered in Berlin. All of Coos County, of which Berlin is the largest community, has been designated as a Redevelopment Area by the Area Redevelopment Authority under Section 5b (6) of Public Law 87-27. While the river communities in New Hampshire, below the Sawmill Dam in Berlin, enjoy a measure of prosperity, the rest of Coos County, completely rural, presents limited job opportunities for its inhabitants. The project, by putting to work labor currently unemployed or under-employed, may therefore

be credited with the wages paid to such labor. The "redevelopment" benefit to such employment is estimated to be $5,000,000. Expressed as an equivalent annual value, this amounts to $148,000.

46. SUMMARY OF BENEFITS

The total annual benefits creditable to the project for flood control and allied purposes are summarized in Table 5.

TABLE 5

SUMMARY OF AVERAGE ANNUAL BENEFITS
(1964 Price Level)

Source of Benefit	
Flood Prevention	$ 204,000
Hydroelectric power	3,594,000
General recreation	289,000
Sub-total	$4,087,000
Redevelopment	148,000
Total annual benefits	$4,235,000

SECTION XIV - PROJECT FORMULATION AND ECONOMIC JUSTIFICATION

47. GENERAL

The Pontook project considered herein will provide the most practicable and economic means at this time for the continued development of the water resources potential of the basin. It harnesses for public use one of the last major undeveloped areas in the basin. Each of the purposes included in the project is adequately warranted.

The benefit-cost ratio for the project, exclusive of redevelopment benefits is 1.7. With redevelopment benefits, the benefit-cost ratio is 1.8.

48. POWER

In accordance with the policies and standards set forth in Senate Document No. 97, 87th Congress, 2nd Session, the limit on the separable cost of including power as a project purpose is the cost of alternative measures for serving the same need. The alternative measure is considered to be the cost of an equivalent, Federally-financed thermal power plant excluding taxes and insurance, even though construction of such a plant would not be undertaken in the absence of the water project. Reduced to an annual cost basis, the separable cost for power is $1,646,000; the annual cost of an equivalent thermal power plant is $1,700,000. This comparability requirement is therefore satisfied.

SECTION XV - ALLOCATION AND APPORTIONMENT OF COSTS

49. ALLOCATION OF COSTS TO PROJECT PURPOSES

a. General. The recommended project includes three initial purposes: flood control, power, and recreation. Ultimately the project will provide additional benefits for water quality improvement but the fulfillment of these benefits is dependent upon other action, the timing of which cannot be forecast at this time. The total project cost is allocated among the three purposes in accordance with standard procedures which distributes project costs among the purposes served so that all purposes share equitably in the savings of multiple-purpose construction. The cost allocated to each purpose is less than the corresponding benefits and each purpose is allocated at least its separable cost. The "Separable Cost-Remaining Benefits Method" was used for this report, resulting in the following allocations among project purposes:

Purpose	First Cost	Annual Charges
Flood control	$ 5,086,000	$ 192,000
Power	46,640,000	1,997,000
Recreation	4,274,000	237,000
Total	$56,000,000	$2,426,000

50. APPORTIONMENT OF COSTS BETWEEN FEDERAL AND NON-FEDERAL INTERESTS

a. Flood Control. Since the flood damage prevention benefits are widespread in character, all costs allocated to flood control are considered a Federal responsibility in accordance with the 1936 Flood Control Act, as amended.

b. Power. Section 5 of the 1944 Flood Control Act provides that electric power and energy generated at reservoir projects constructed by the Department of the Army, over and above the energy required for operation of the project, shall be turned over to the Secretary of the Interior for disposal.

c. Recreation. In accordance with the cost-sharing policy set forth in H. R. 9032, introduced in the 88th Congress, First Session, on 6 November 1963, the separable construction costs allocated to general recreation and fish and wildlife enhancement are non-reimbursable and assigned to the Federal Government in the sum of (1) the specific costs incurred initially for land and basic facilities for recreation or fish and wildlife enhancement; and (2) other costs for lands and facilities included in the separable costs allocated to recreation and fish and wildlife enhancement, in the aggregate, up to a limit of 25 percent of the first costs of joint-use land and facilities, or $5,000,000, whichever is less. In addition, the joint construction costs of lands and facilities allocated to recreation and fish and wildlife enhancement is non-reimbursable and assigned to the Federal Government up to certain stated limits. Non-Federal interests would be required to assume any remaining costs allocated to recreation and fish and wildlife enhancement.

In the Pontook project, only the general recreation costs fall under the purview of H. R. 9032 since costs related to fish and wildlife are for mitigation of losses expected to result from the project and no enhancement is anticipated by the U. S. Fish and Wildlife Service. Under these provisions, the capital cost allocated to recreation including separable and joint costs is $4,274,000, which is within the limits stipulated above. Total costs allocated to recreation would therefore be assigned entirely to the Federal Government under the cost-sharing policy set forth in H. R. 9032.

Subsequent to completion of studies for this report, policies and procedures with respect to division of responsibility between Federal and non-Federal interests regarding recreation and fish and wildlife enhancement features of Federal multiple-purpose reservoirs have been in a continuing state of transition. The policies and procedures set forth in House of Representatives Bill Numbered 9032 were a part of this transition. The Congress did not act on H. R. 9032. In the most recent action on this matter, proposed legislation was introduced with Administration sponsorship as House of Representatives Bill Numbered 5269, 89th Congress, First Session, cited as the "Federal Water Project Recreation Act." The Bureau of the Budget has advised that it expects the agencies concerned to implement immediately the policies and procedures set forth in the proposed Act.

Fundamentally, the proposed Act provides for a substantial level of Federal participation in the cost of development for recreation and fish and wildlife enhancement at projects such as the Pontook Dam and Reservoir if non-Federal interests agree to administer project land and water areas for these purposes, bear not less than one-half of the separable project costs allocated thereto, and bear all the costs of operation, maintenance, and replacement of lands and facilities for recreation and fish and wildlife enhancement. The proposed Act includes provisions responsive to problems of adjustment to a new policy in the case of projects for which preauthorization planning is well advanced, and for adoption of plans to reflect the intentions of non-Federal interests with respect to participation in the cost of recreation and fish and wildlife enhancement activities at various stages of project planning and implementation.

On the basis of the Administration's position, local interests would be required to:

a. Administer project land and water areas for recreation and fish and wildlife enhancement;

b. Pay, contribute in kind, or repay (which may be through user fees), with interest, one-half of the separable cost of the project allocated to recreation and fish and wildlife enhancement, an amount currently estimated at $600,000 based on the presently planned level of initial development for these purposes, and $1,200,000 based on the ultimate plan of development; and

c. Bear all costs of operation, maintenance, and replacement of lands and facilities for recreation and fish and wildlife enhancement, an

amount currently estimated at $34,000 annually for the initial recreational development and $52,000 on an average annual basis for the ultimate development.

The provision of additional (non-project) facilities for further enhancement and development of the recreational resource, including such items as lodges, boat rental services, and expanded public park facilities, would be entirely a non-Federal responsibility to be provided under license by a duly authorized State or local agency.

SECTION XVI - COORDINATION WITH OTHER AGENCIES

51. GENERAL

Coordination with Federal and State agencies having an interest in the proposed improvement was carried out during the course of the report studies. The agencies reviewed the plans for the various projects considered and furnished comments and recommendations relative to the phase of development in which they have a primary interest. The agencies include: the U. S. Department of the Interior (Fish and Wildlife Service, Bureau of Outdoor Recreation, the National Park Service, and the Power Marketing Agency); the Federal Power Commission; the Department of Health, Education and Welfare; the Soil Conservation Service of the Department of Agriculture; and the New Hampshire Department of Resources and Economic Development, and the Department of Public Works and Highways. The suggestions and recommendations made by these agencies for meeting the various needs have generally been followed in the development of the project. Letters of comment are included in Attachment I to this report.

SECTION XVII - DISCUSSION

52. DISCUSSION

a. General. The investigation of the Androscoggin River basin was undertaken to determine whether any modifications are advisable in the recommendations contained in the prior reports on this basin. Various Federal and non-Federal agencies were contacted during the investigation for information concerning water supply, water quality, hydroelectric power, recreation, and fish and wildlife potentials of studied project sites. The reports of the agencies indicated the general need for and value of such developments. A primary problem considered in the study for this report was to determine a feasible

solution to the flood problems on a basin-wide basis within a framework of overall resource development.

b. Flood problems. The Androscoggin River basin is subject to destructive floods that completely disrupt the normal economy of the basin. Extensive areas in industrial, commercial, and residental communities along the main stem of the river and on three tributaries, the Dead River in New Hampshire, and the Swift and Little Androscoggin Rivers in Maine are subject to damage from flooding. The flood of March 1936, the most damaging ever experienced in the basin, took four lives, made 1,500 families temporarily homeless and caused losses estimated at $4,392,000. A more recent damaging flood occurred in March 1953 and caused losses estimated at $2,230,000. A recurrence of the experienced 1936 flood levels would cause damages of $12.5 million in the basin under present economic conditions without flood control. With increasing development of the flood plains, the recurring damage figure becomes greater. Population growth and industrial expansion tend to gravitate toward increased use of the easily developable flood plains.

c. Solutions considered. All practicable methods for solving the flood problems were considered. These included single and multiple purpose reservoirs, local protection by dikes, floodwalls, diversion of flood waters, channel improvements, flood plain zoning, and various combinations of these methods.

In the studies, it was found that single-purpose solutions to the various basin problems, including either storage reservoirs or channel improvement work are generally unsuitable at this time. This type of analysis fails to consider the full utilization of the water and related resources available.

d. Plan of improvement. The plan found most suitable for development at this time consists of a multiple-purpose storage reservoir in the Pontook area of Dummer, New Hampshire. The reservoir would reduce flood damages, provide hydroelectric power, and meet an expanding recreation need. In a recurrence of the 1936 flood under current conditions in the Berlin-Gorham area, the Pontook project would reduce loss from $1,900,000 to $150,000.

Investigation of all likely potential flood control reservoir sites in the basin disclosed no other economically feasible sites which should be developed for flood control and allied purposes at the present

time. The investigation of the proposed project disclosed that there is a need for additional recreational facilities; that lands for mitigation of wildlife losses and lands and developments for compensation of fishery losses, and development of waterfowl habitat and hunting opportunities are appropriate project costs; and that hydroelectric power generated at the site could be effectively absorbed as soon as available.

The construction of the project as proposed in this report would be fully compatible with any comprehensive, long-range plan for use of the total water resources of the Androscoggin River basin. The estimated total first cost of the proposed plan is $57,200,000 with average annual economic charges of $2,426,000. Average annual benefits are $4,235,000, resulting in a benefit to cost ratio of 1.8 to 1.0. Without redevelopment benefits, the benefit to cost ratio is 1.7. The benefits accruing to each of the project purposes (flood control, power and recreation) are greater than the costs allocated to the respective purposes.

e. Private power studies underway. The Public Service Company of New Hampshire has received a preliminary permit dated 10 March 1965 from the Federal Power Commission to make economic studies in regard to possible construction and operation of a hydroelectric project at the Pontook site. At the present time, it is too early to predict the results of these studies should they be undertaken. Preliminary contacts with company officials indicate the possibility that the company may request a partnership arrangement with the Federal Government after the Pontook project, recommended in this report, is authorized.

f. Additional information called for by Senate Resolution 148. Additional information on recommended and alternative projects called for by Senate Resolution 148, 85th Congress, adopted 28 January 1958 is contained in Attachment II to this report.

SECTION XVIII - CONCLUSIONS AND RECOMMENDATIONS

53. CONCLUSIONS

The improvement presented in this report has been planned to fully utilize the site and to be an essential unit in the long range plan for development of the water resources in the Androscoggin River basin. The site should be developed for flood control, power production, and recreational purposes. The acquisition of additional lands for stream fisheries, deer wintering yards and water fowl, and development of a sub-impoundment for water fowl within and contiguous

to the reservoir area would compensate for fish and wildlife losses expected to result from construction of the project.

The Federal Power Commission has indicated that power produced at the Pontook project would readily be absorbed in the area as developed. The Department of the Interior considers that the project power is marketable and desirable to meet power requirements of the area and that the power investment can be repaid within a 50-year period.

The dam and reservoir is amply justified by evaluated benefits which results in an economic ratio of annual benefits to annual charges of 1.8 to 1.0.

The studies made for this report also found that major local flood protection measures, supplemental to storage reservoir facilities in the basin, are not economically justified at the present time. Small flood protection measures, if economically justified, could be constructed under authority of Section 205 of the Flood Control Act of 1962.

54. RECOMMENDATIONS

The Division Engineer recommends that the Pontook project on the Androscoggin River, in the town of Dummer, New Hampshire, be authorized for flood control, hydroelectric power, and recreation substantially in accordance with the plans presented in this report, with such modifications as the Chief of Engineers considers advisable, at an estimated initial first cost of $56,000,000 and average annual costs of $426,000 for operation, maintenance and major replacements. The recommended project includes acquisition of 8,800 acres of land, valued at $550,000, and construction of parking areas, deer wintering yards, and a wildlife impoundment at a total cost of $250,000 for the mitigation of fish and wildlife losses induced by the project. He further recommends that additional facilities for recreation, estimated to cost $1,200,000, be provided in the future as the need and the economic justification for such additional facilities become established.

On the basis of the Administration's position, as set forth in H. R. 5269, 89th Congress, First Session, prior to initiation of construction of the Pontook Dam and Reservoir, local interests would be required to furnish assurances satisfactory to the Secretary of the Army that, in accordance with the proposed Federal Water Project Recreation Act cited above, they will:

a. Administer project land and water areas for recreation and fish and wildlife enhancement;

b. Pay, contribute in kind, or repay (which may be through user fees) with interest, one-half of the separable cost of the project allocated to recreation and fish and wildlife enhancement, an amount currently estimated at $600,000 based on the presently planned level of initial development for these purposes, and $1,200,000 based on the ultimate plan of development; and

c. Bear all costs of operation, maintenance and replacement of lands and facilities for recreation and fish and wildlife enhancement, an amount currently estimated at $34,000 annually for the initial recreational development and $52,000 on an average annual basis for the ultimate development.

Provided, that the sizing and responsibility for development, operation, maintenance, and replacement of the recreation and fish and wildlife enhancement features of the reservoir may be modified in accordance with the alternatives provided in the proposed Federal Water Project Recreation Act cited above, depending upon the intentions of non-Federal interests regarding participation in the costs of these features at the time of reservoir construction and subsequent thereto, and that appropriate adjustments reflecting such modifications may be made in the allocation of costs to other project purposes.

The net cost to the United States for the Pontook Dam and Reservoir, under the provisions of H. R. 5269, would be $55,400,000 for construction, after payment by local interests of costs allocated to recreation and fish and wildlife enhancement, based on the presently planned level of initial development for these purposes, and $56,000,000 based on the ultimate plan of development. Net average annual costs to the United States for operation, maintenance, and major replacements are estimated at $374,000.

3 Incl
1. Letters of Comment and Concurrence
2. S-148 Supplement
3. Volume II
Appendices A through I

E. J. RIBBS
Colonel, Corps of Engineers
Acting Division Engineer

ACKNOWLEDGEMENTS AND IDENTIFICATION OF PERSONNEL

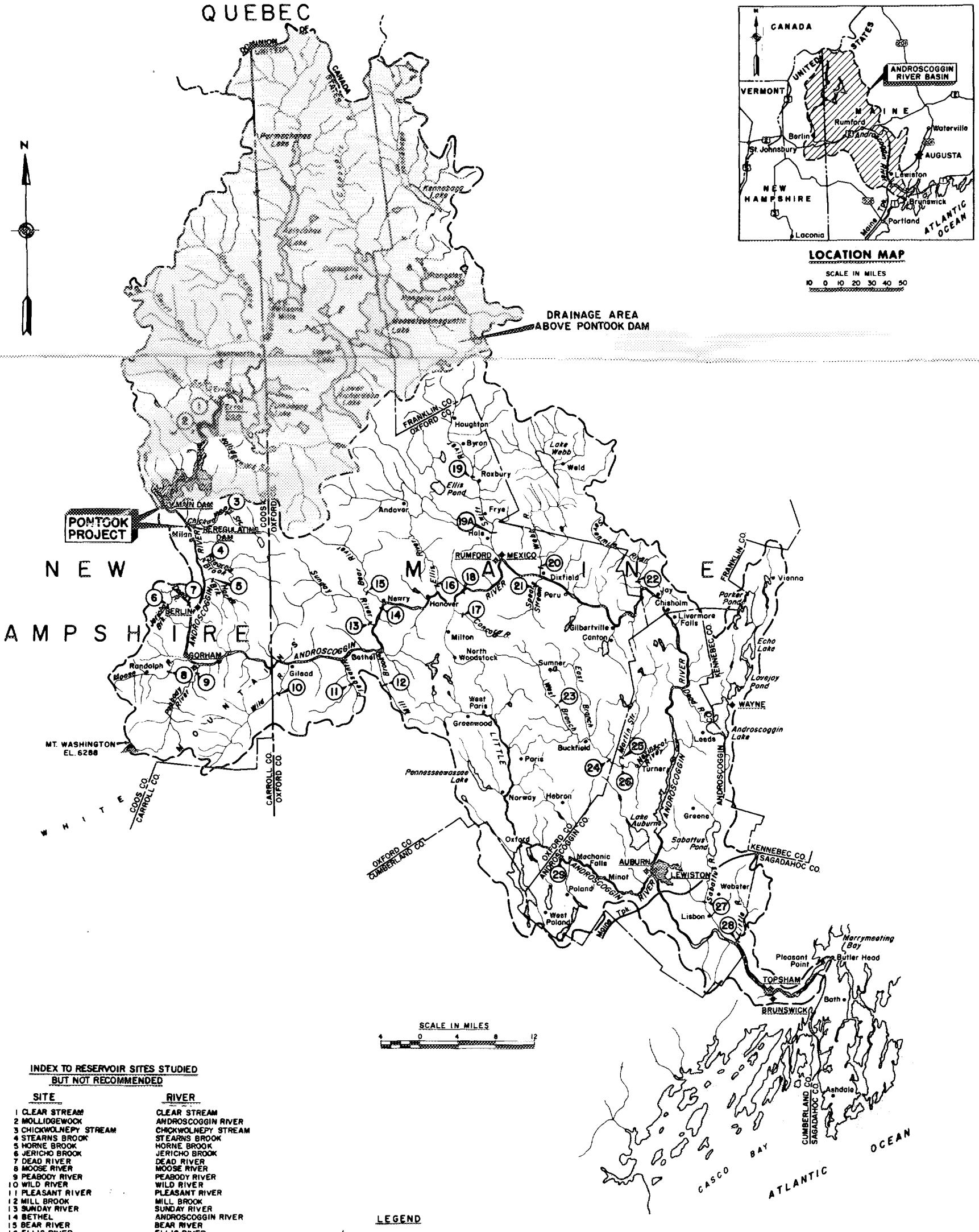
1. The preparation of this report was administered by:

Colonel Edward J. Ribbs, Acting Division Engineer
John Wm. Leslie, Chief, Engineering Division
Edward L. Hill, Chief, Planning and Reports Branch
William A. Slagle, Jr., Chief, Northeast Flood Studies

2. This report was prepared under the direction of David Cohen, Project Engineer.

3. The U. S. Army Engineer Division, New England, is appreciative of the cooperation rendered in connection with this study by personnel of other Federal agencies, State agencies, and local interests, particularly the following:

U. S. Fish and Wildlife Service
U. S. Public Health Service
Federal Power Commission
Project Director, New Hampshire State Planning Project
N. H. State Department of Public Works and Highways
Public Service Company of New Hampshire



INDEX TO RESERVOIR SITES STUDIED BUT NOT RECOMMENDED

SITE	RIVER
1 CLEAR STREAM	CLEAR STREAM
2 MOLLIDGEWOCK	ANDROSCOGGIN RIVER
3 CHICKWOLNEPY STREAM	CHICKWOLNEPY STREAM
4 STEARNS BROOK	STEARNS BROOK
5 HORNE BROOK	HORNE BROOK
6 JERICHO BROOK	JERICHO BROOK
7 DEAD RIVER	DEAD RIVER
8 MOOSE RIVER	MOOSE RIVER
9 PEABODY RIVER	PEABODY RIVER
10 WILD RIVER	WILD RIVER
11 PLEASANT RIVER	PLEASANT RIVER
12 MILL BROOK	MILL BROOK
13 SUNDAY RIVER	SUNDAY RIVER
14 BETHEL	ANDROSCOGGIN RIVER
15 BEAR RIVER	BEAR RIVER
16 ELLIS RIVER	ELLIS RIVER
17 CONCORD RIVER	CONCORD RIVER
18 RUMFORD	ANDROSCOGGIN RIVER
19 ROXBURY	SWIFT RIVER
19A HALE	SWIFT RIVER
20 DIXFIELD	WEBB RIVER
21 SPEARS STREAM	SPEARS STREAM
22 SEVENMILE STREAM	SEVENMILE STREAM
23 SUMNER	NEZINSCOT RIVER
24 BUCKFIELD	NEZINSCOT RIVER
25 MARTIN STREAM	MARTIN STREAM
26 TURNER	NEZINSCOT RIVER
27 SABATTUS RIVER	SABATTUS RIVER
28 LITTLE RIVER	LITTLE RIVER
29 OXFORD	LITTLE ANDROSCOGGIN RIVER

LEGEND

(1) RESERVOIR SITES STUDIED BUT NOT RECOMMENDED

◆ TOPSHAM — LOCAL PROTECTION PROJECTS STUDIED BUT NOT RECOMMENDED

PONTOOK PROJECT — MULTI-PURPOSE PROJECT RECOMMENDED

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CH. BY
L.R.M.	M.S. G.H.D.	D.C.

ENGINEER

PROJECT ENGINEER

CHIEF, ENGINEERING DIV.

CHIEF, PLANN. & OPTS. DIV.

APPROVED

DATE APRIL 1965

ANDROSCOGGIN RIVER BASIN, MAINE & N.H.

BASIN MAP

ANDROSCOGGIN RIVER, MAINE & N.H.

TO ACCOMPANY REPORT DATED: 15 APRIL 1965

SCALE AS SHOWN

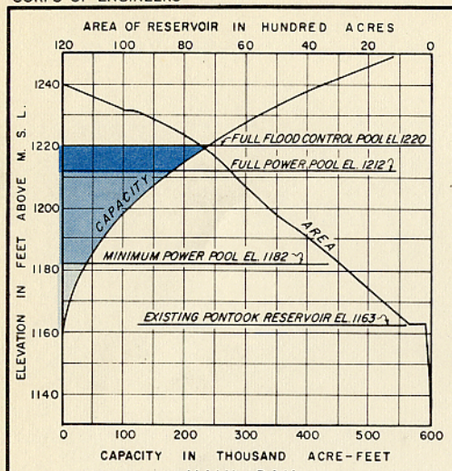
DRAWING NUMBER

SHEET 1 OF 1

PLATE NO. 1

CORPS OF ENGINEERS

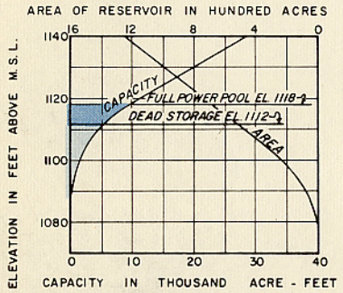
U. S. ARMY



MAIN DAM

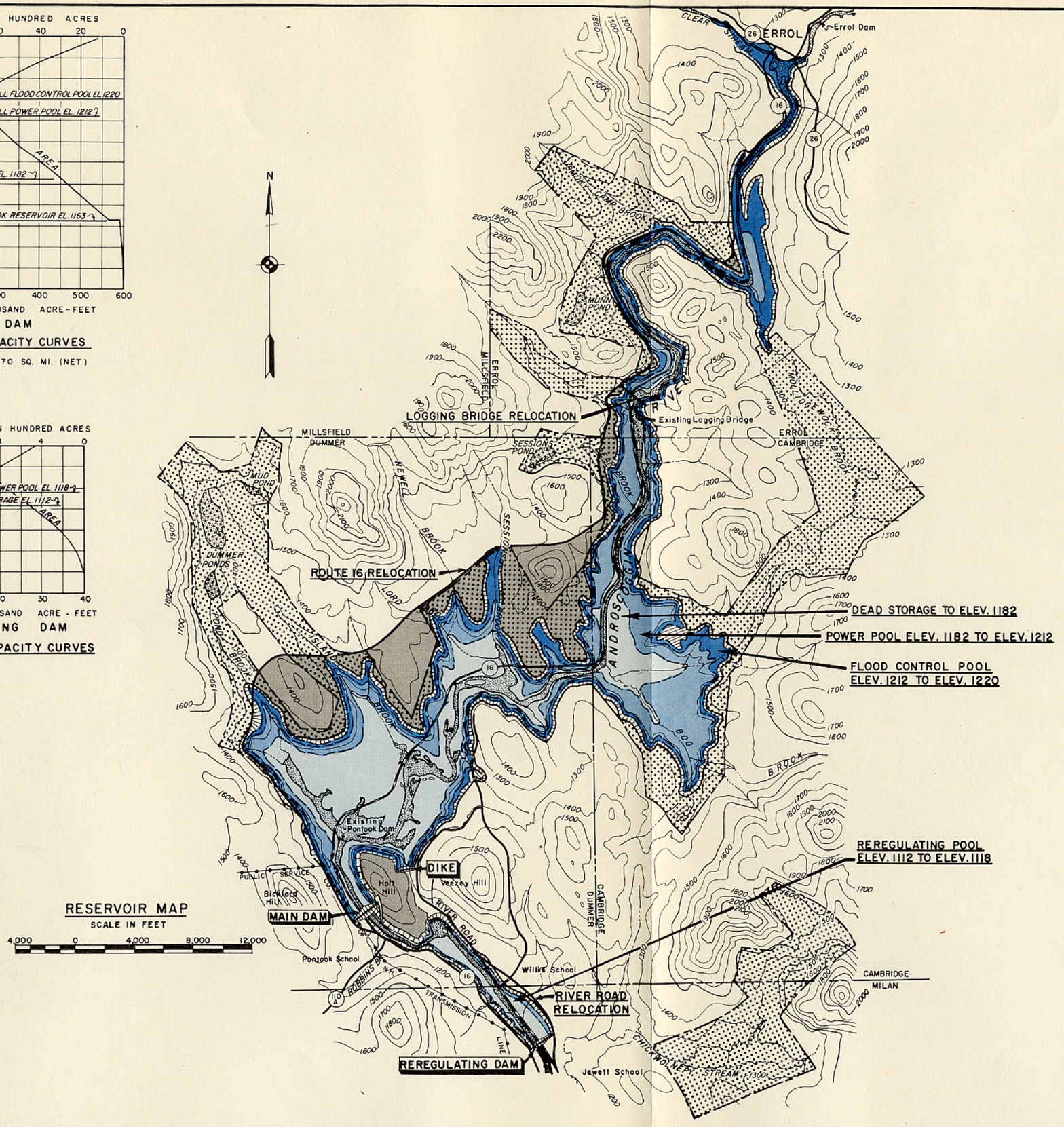
AREA AND CAPACITY CURVES

DRAINAGE AREA 170 SQ. MI. (NET)



REREGULATING DAM

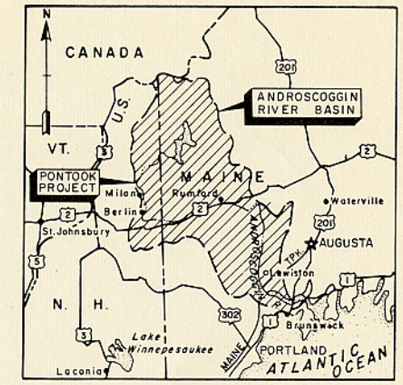
AREA AND CAPACITY CURVES



RESERVOIR MAP

SCALE IN FEET

4,000 0 4,000 8,000 12,000



LOCATION MAP

SCALE IN MILES

10 0 10 20 30 40 50

LEGEND

- EXISTING WATERWAYS
- DEAD STORAGE
- POWER & RECREATION STORAGE
- FLOOD CONTROL STORAGE
- BUFFER STRIP ADJACENT TO FULL FLOOD CONTROL POOL
- LIMITS OF LAND FOR FISH & WILDLIFE MITIGATION
- FISH & WILDLIFE LANDS
- RECREATION LANDS
- COMBINED RECREATION, FISH & WILDLIFE LAND

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
J.T.S.	G.H.D.	D.C.

ENGINEER

PROJECT ENGINEER

CHIEF, N. ENG. B. SECTION

SUBMITTED BY

CHIEF, PLANN. & R.P.T. BRANCH

APPROVED

CHIEF ENGINEERING DIV.

ANDROSCOGGIN RIVER BASIN

PONTOOK PROJECT

RESERVOIR MAP

ANDROSCOGGIN RIVER, NEW HAMPSHIRE.

DATE APRIL 1965

SCALE: AS SHOWN | SPEC. NO. CIV. ENG.-19-016-

DRAWING NUMBER

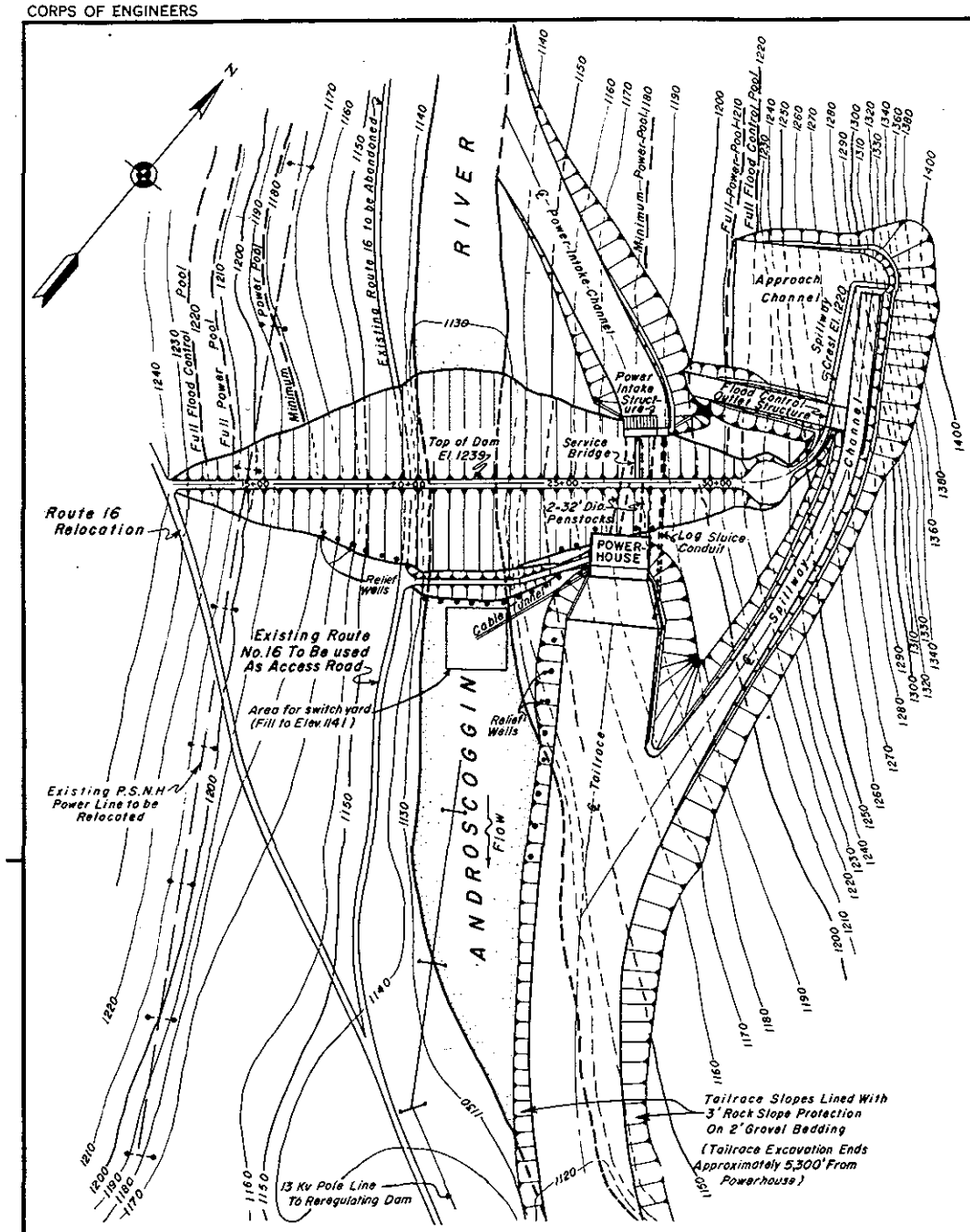
TO ACCOMPANY REPORT DATED: 15 APRIL 1965

SHEET 1 OF 1

PLATE NO. 2

CORPS OF ENGINEERS

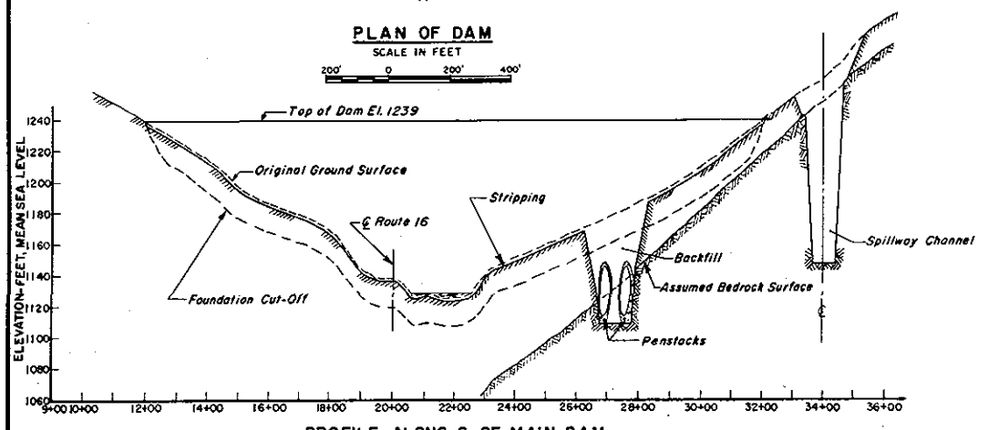
U. S. ARMY



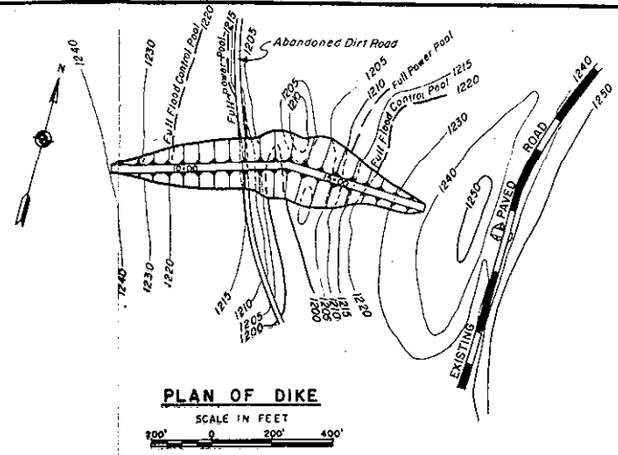
PLAN OF DAM

SCALE IN FEET

200' 0 200' 400'



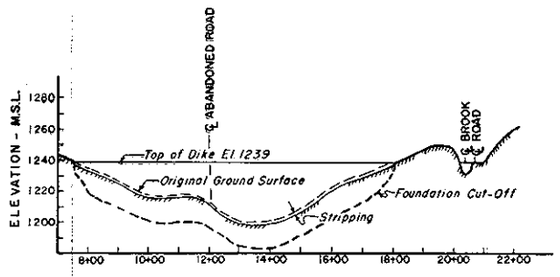
PROFILE ALONG ℄ OF MAIN DAM



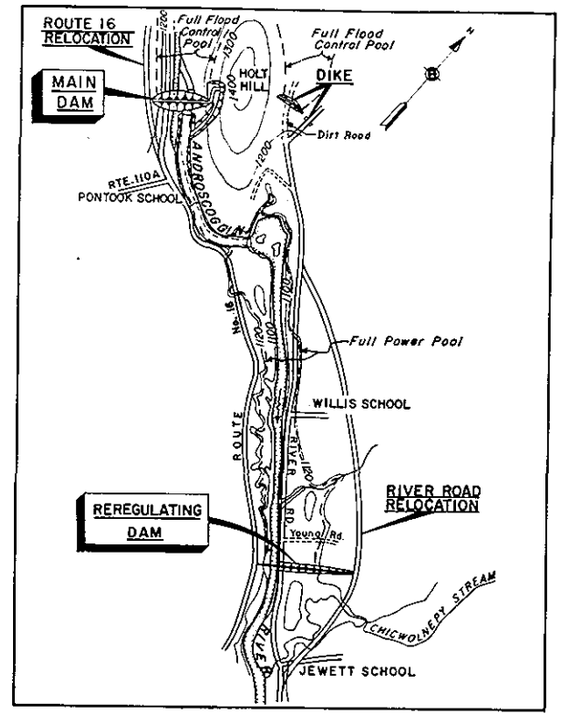
PLAN OF DIKE

SCALE IN FEET

200' 0 200' 400'



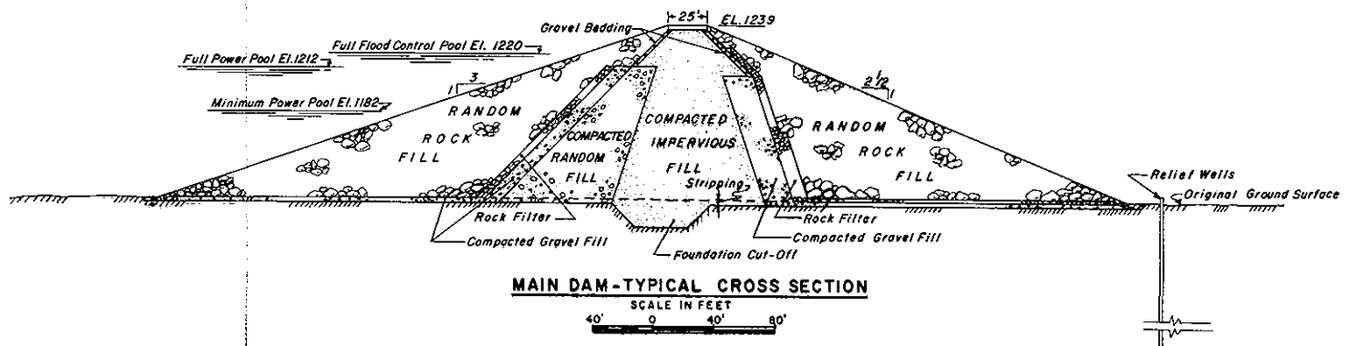
PROFILE ALONG ℄ DIKE



PROJECT MAP

SCALE: 1" = 2000'

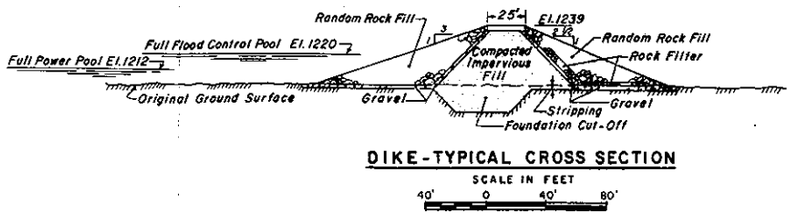
2000' 0 2000' 4000'



MAIN DAM-TYPICAL CROSS SECTION

SCALE IN FEET

40' 0 40' 80'



DIKE-TYPICAL CROSS SECTION

SCALE IN FEET

40' 0 40' 80'

NOTES:

For Reregulating Dam See Plate 4

For Power Stations & Gateworks See Plate 5

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DR. BY J.T.S.	TR BY G.M.D	CK. BY D.C.

ENGINEER

PROJECT ENGINEER

CHIEF, CIV. P. SECTION

CHIEF, PLANS & RPTS. BRANCH

ANDROSCOGGIN RIVER BASIN, MAINE & N.H.

PONTOOK PROJECT

MAIN DAM & DIKE

ANDROSCOGGIN RIVER, NEW HAMPSHIRE

SUBMITTED BY

APPROVED

DATE APRIL 1965

CHIEF ENGINEERING DIV.

TO ACCOMPANY REPORT DATED: 15 APRIL 1965

SCALE AS SHOWN SPEC. NO. CIV ENG-19-016-

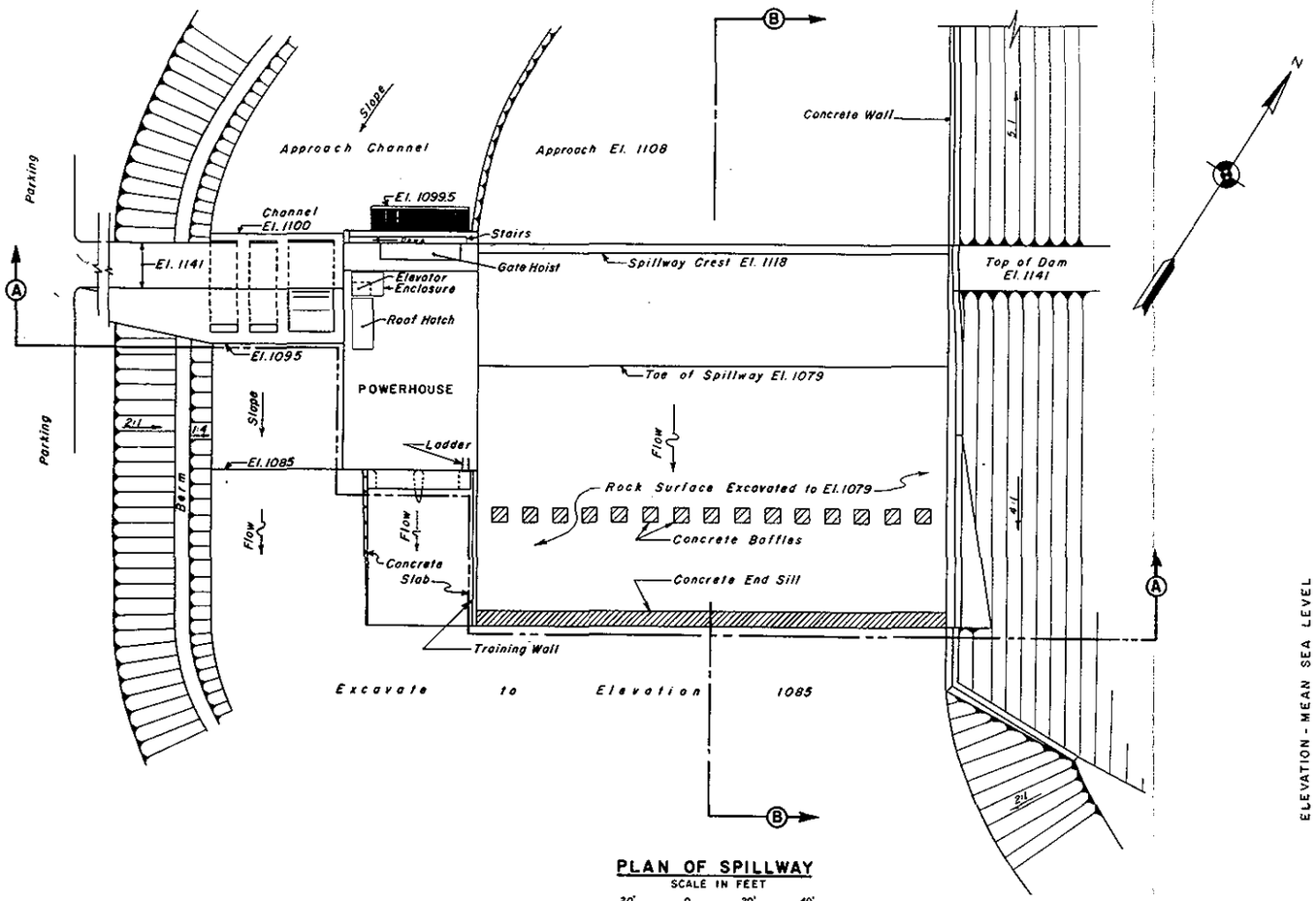
DRAWING NUMBER

SHEET 1 OF 3

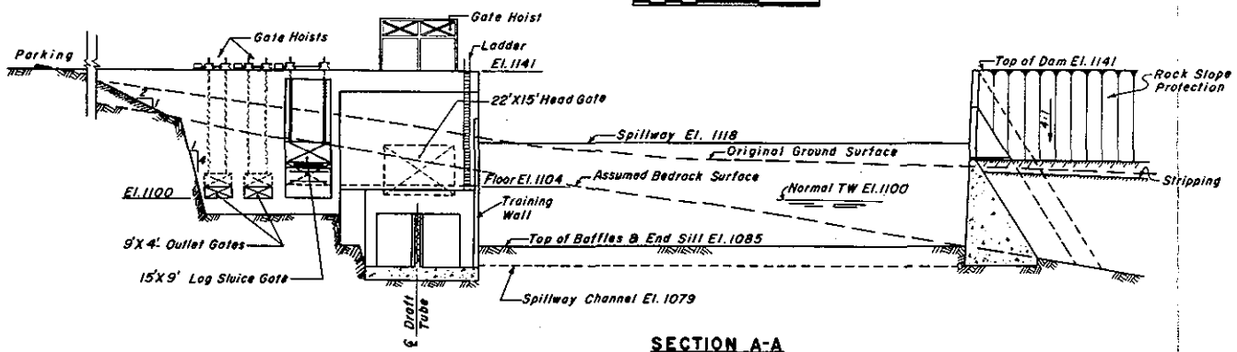
PLATE NO. 3

CORPS OF ENGINEERS

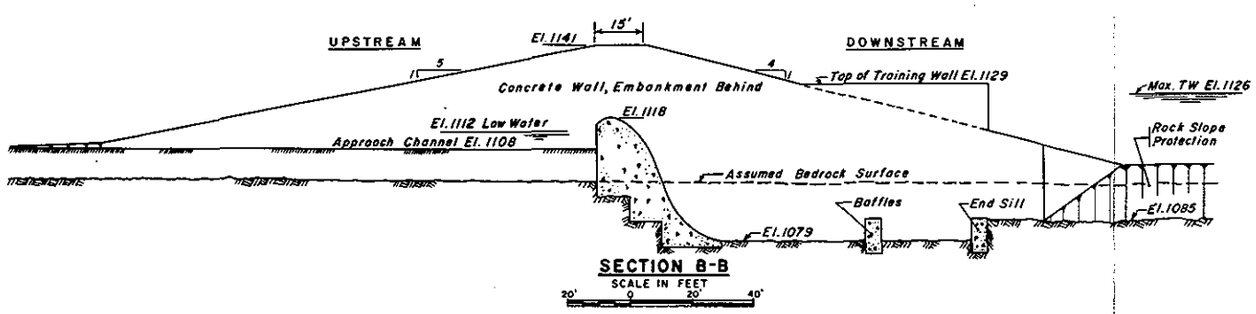
U. S. ARMY



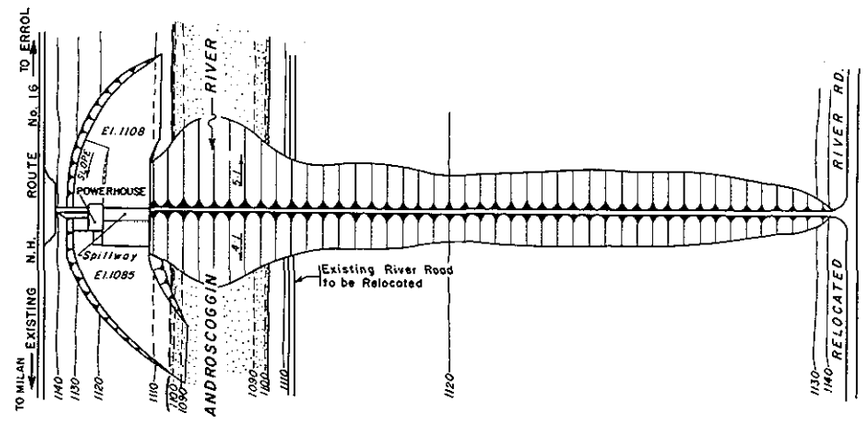
PLAN OF SPILLWAY
SCALE IN FEET
20' 0 20' 40'



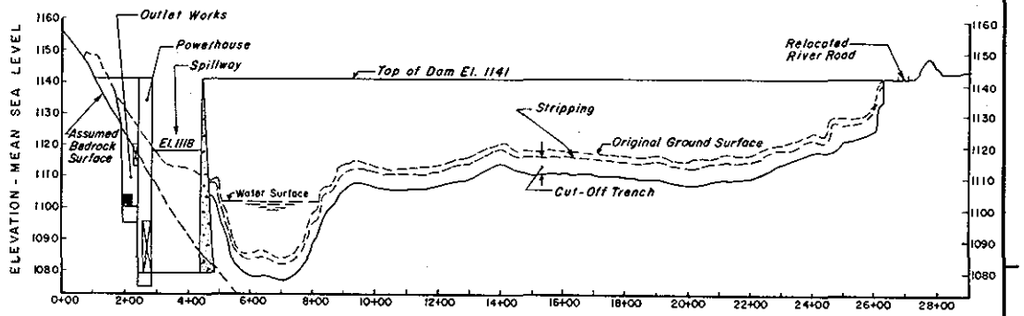
SECTION A-A
SCALE IN FEET
20' 0 20' 40'



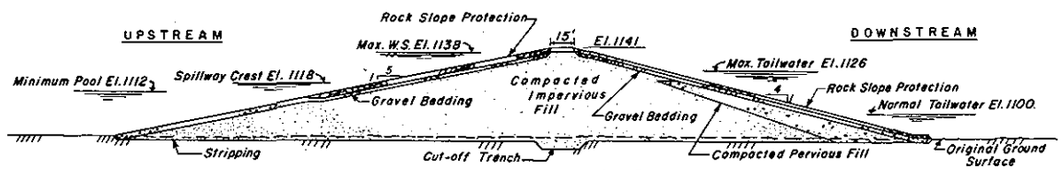
SECTION B-B
SCALE IN FEET
20' 0 20' 40'



PLAN OF DAM
SCALE IN FEET
200' 0 200' 400'



PROFILE THROUGH ℄ OF DAM



TYPICAL CROSS SECTION
SCALE IN FEET
40' 0 40' 80'

NOTES:
For Floor Plan & Section of Powerhouse See Plate 5

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR BY	CK. BY
J.T.S.	G.H.D.	D.C.

ENGINEER
PROJECT ENGINEER
CHIEF, INVES. SECTION
SUBMITTED BY
CHIEF, PLANS & RPTS BRANCH
APPROVED
CHIEF ENGINEERING DIV.

ANDROSCOGGIN RIVER BASIN, MAINE & N.H.

PONTOOK PROJECT
REREGULATING DAM

ANDROSCOGGIN RIVER, NEW HAMPSHIRE

DATE APRIL 1965

SCALE AS SHOWN | SPEC. NO CIV ENG.-19-016-

DRAWING NUMBER

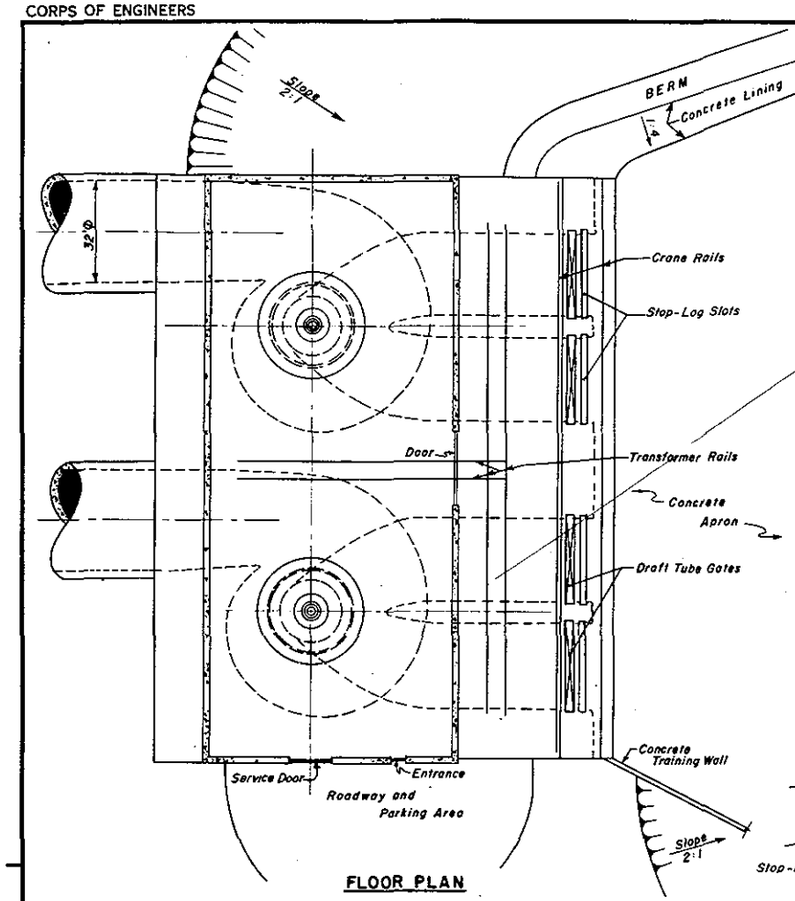
SHEET 2 OF 3

TO ACCOMPANY REPORT
DATED: 15 APRIL 1965

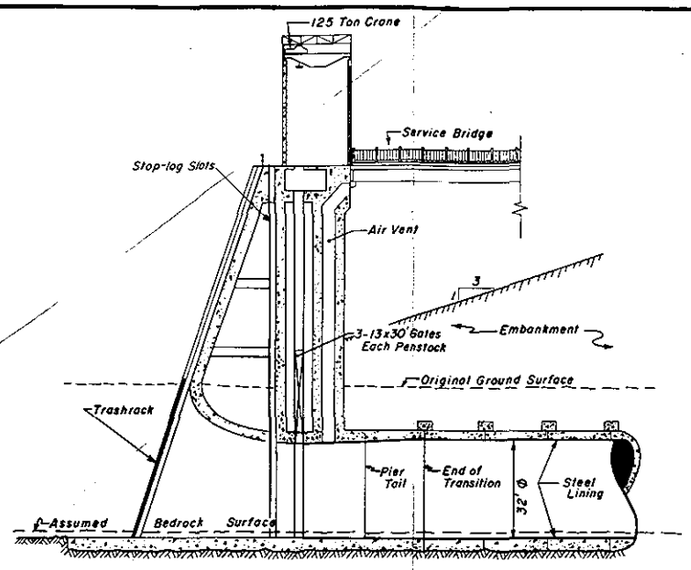
PLATE NO. 4

CORPS OF ENGINEERS

U. S. ARMY



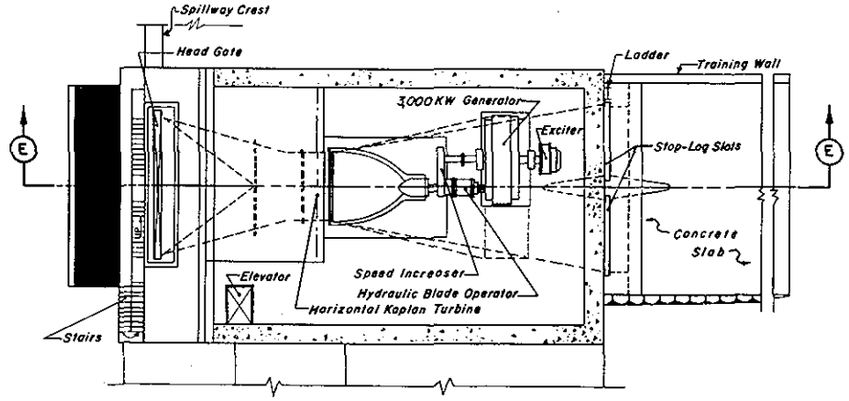
FLOOR PLAN



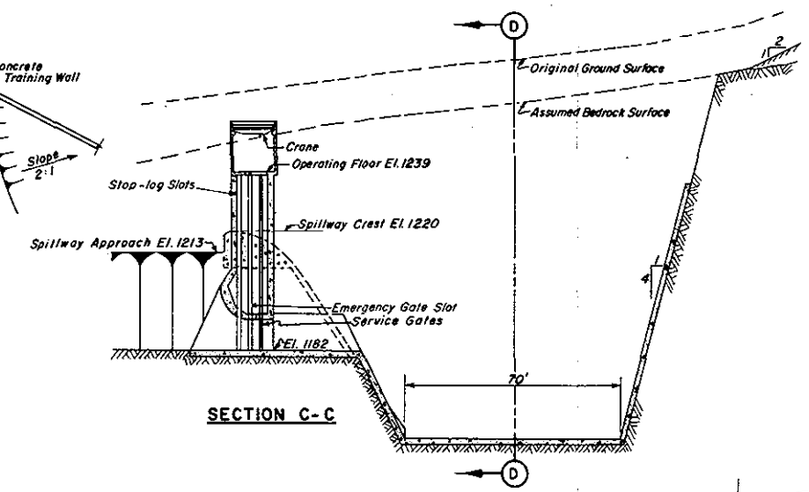
PENSTOCK INTAKE

SCALE IN FEET

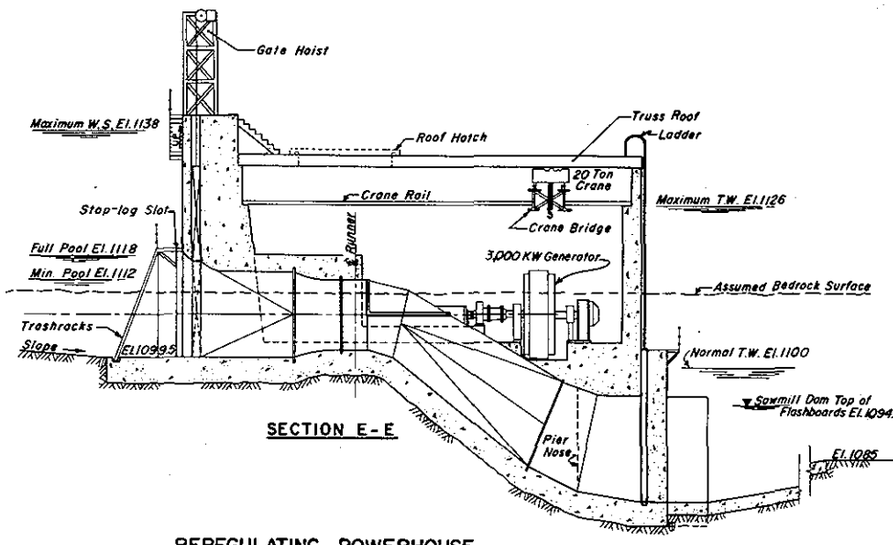
20' 0 20' 40'



FLOOR PLAN



SECTION C-C

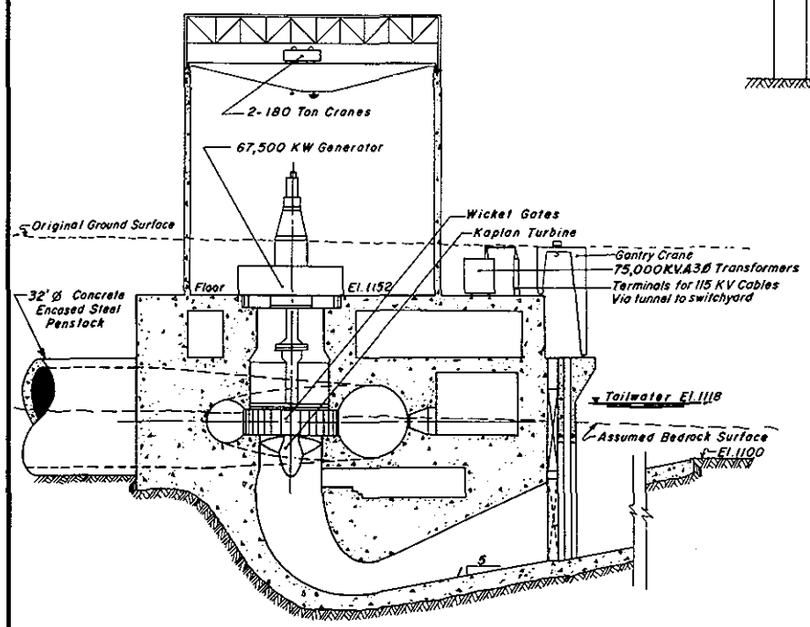


SECTION E-E

REREGULATING POWERHOUSE

SCALE IN FEET

10' 0 10' 20'

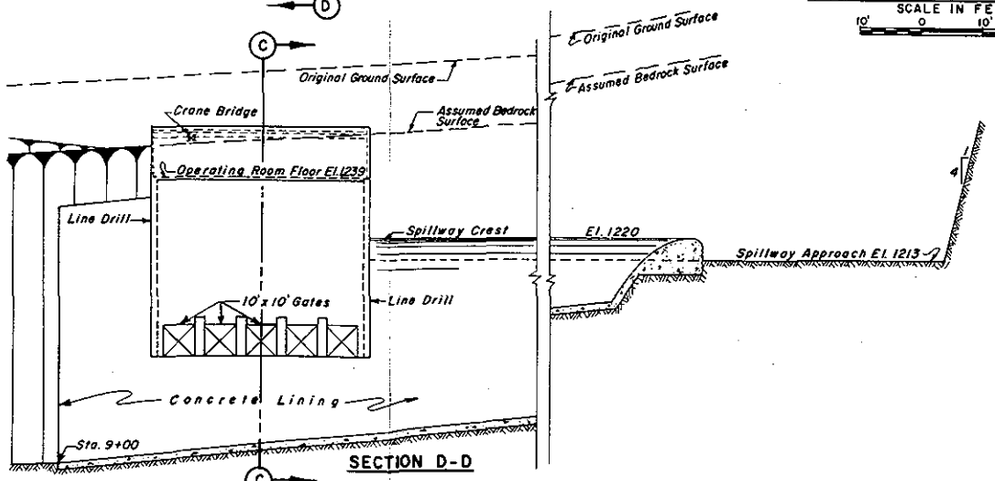


SECTION

MAIN POWERHOUSE

SCALE IN FEET

20' 0 20' 40'



SECTION D-D

FLOOD CONTROL OUTLET STRUCTURE

SCALE IN FEET

20' 0 20' 40'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
J.T.S.	G.H.D.	D.C.

ENGINEER

PROJECT ENGINEER

CHIEF, REPTS. SECTION

SUBMITTED

CHIEF, PLANS, REPTS. & BRANCH

APPROVED

CHIEF ENGINEERING DIV.

ANDROSCOGGIN RIVER BASIN, MAINE & N.H.

PONTOOK PROJECT
POWER STATIONS & GATEWORKS

ANDROSCOGGIN RIVER, NEW HAMPSHIRE

DATE APRIL 1965

SCALE: AS SHOWN SPEC. NO. CIV. ENG.-19-016-

DRAWING NUMBER

TO ACCOMPANY REPORT DATED: 15 APRIL 1965

SHEET 3 OF 3

PLATE NO. 5

ATTACHMENT I

LETTERS OF COMMENT AND CONCURRENCE

ATTACHMENT I

INDEX

LETTERS OF COMMENT AND CONCURRENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

NOV 17 1964

Dear General Hyzer:

In response to the request of October 15 and other correspondence from your office concerning the marketability of the hydroelectric power potential in the Pontook multiple-purpose project on the Androscoggin River in New Hampshire which you are currently evaluating, we are submitting the following comments.

Our analysis is based on data furnished by your office including the October 15 letter which incorporates your recent regulation studies of the existing upstream reservoirs. The power features are as follows:

1. The main Pontook Dam and Powerplant with an installed capacity of 135-Mw, all of which is dependable to meet a December peak load. The average annual energy output is 107 million kilowatthours.

2. The reregulation Dam and Powerplant about three miles downstream with an installed capacity of 3-Mw, of which 2-Mw is dependable capacity. The average annual energy output is 18 million kilowatthours.

3. Downstream benefits at existing private utility plants of 19 million kilowatthours annually.

Based on the above, the Pontook Project with a total installed capacity of 138-Mw and generation of 125 million kilowatthours annually constitutes a potential source of peaking power to supply a demand of about 10 percent load factor. Since the load pattern in the New England area is characterized by daily sharp peak demands, a growing need for large quantities of peaking power is predicted for the future to which Pontook could contribute.

The estimated cost for the project without transmission is $54,000,000 of which $44,681,000 was allocated to power. The cost allocated to

EXHIBIT 1 - 1/1

power with interest during construction of $4,188,000 which totals $48,869,000 for the power investment can be repaid within a 50-year period at 3 1/8 percent on the unpaid balance, with annual revenues of $1,945,000. The operation and maintenance and major replacements total $351,000, requiring a total annual revenue of $2,296,000 to repay the cost allocated to power.

The average annual revenues for repayment can be provided by marketing the 125 million kilowatthours of energy at the project's sites at 2.4 mills per kilowatthour and the 19 million kilowatthours at the downstream plants for 4.0 mills per kilowatthour, plus a capacity charge of $14.02 per kilowatt-year.

The Federal Power Commission estimates the value of power at the high-tension bus at the Pontook site as follows:

	Private Financing	Federal Financing
Capacity	$23.40 per Kw-year	$9.60 per Kw-year
Energy	2.4 mills per kwh	2.4 mills per kwh
Energy at downstream plants	4.0 mills per kwh	4.0 mills per kwh

The values of power are based on cost of power from conventional steam-electric generating units and a federally-financed transmission system to delivery points in New Hampshire. The transmission system envisioned by the Federal Power Commission in developing these power values would involve approximately 250 circuit miles of 115-kv transmission lines. The estimated capital cost is $6,200,000 and the annual charges with interest at 3 1/8 percent is $400,400. These costs seem reasonable.

The estimated capacity cost of $14.02 per kilowatt-year is considerably lower than the capacity value of $23.40 per kilowatt-year of a steam alternative based on private financing; hence, the project is feasible and the power output is marketable on a privately-financed alternative.

The capacity cost of $14.02 per kilowatt-year was also compared with a federally-financed steam alternative at $9.60 per kilowatt-year.

The project would not be feasible based on a Federal alternative. However, for the following basic reasons a federally-financed thermal plant, using fossil fuels or utilizing nuclear energy, does not represent a true alternative:

1. No legislative authority exists for the Corps of Engineers or the Department of the Interior to construct or operate thermal plants in the continental United States, nor has the Congress elected to adopt such a policy.

2. Legislative history provides conclusively that the Congress does not envision wholly-financed and wholly-operated Federal nuclear plants. Furthermore, a Federal thermal plant would not result in any water resource development, flood control, river regulation, area redevelopment or outdoor recreational benefits.

The Federal Power Commission's load forecast for 1980 indicates that power requirements for the New England States will increase from approximately 10,000-Mw in 1965 to 23,600-Mw in 1980. Thus it appears there is a need for the power that could be provided from the Pontook Project. Preliminary inspection of the location of possible preference customers within the area indicates that cooperatives and public utilities could utilize this power through a system of interconnections.

We note that the benefit-cost ratio is 1.7 to 1 with the three major features of flood control, power and recreation, and a benefit-cost ratio of 1.8 to 1 with the inclusion of ARA benefits as a distinct project feature.

In conclusion, the hydroelectric power which can be generated by the project is considered to be marketable and desirable to meet power requirements of the area. We, therefore, recommend inclusion of the power features in your evaluation of the project.

Sincerely yours,

Kenneth Holum

Secretary of the Interior

Brig. Gen. P. C. Hyzer
Division Engineer
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts

EXHIBIT I - 1/3

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 Broadway
New York, New York 10013

September 29, 1964

Division Engineer
U. S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

re: Proposed Pontook Project
Androscoggin River, New Hampshire

Dear Sir:

In response to the request contained in your letter of September 11, 1964, we have computed capacity and energy values for the proposed Pontook hydroelectric development at the high tension side of the project step-up substation. These values applicable to the dependable capacity and average annual output of Pontook and the reregulating dam installation, based on private financing of the alternative steam-electric station and associated transmission facilities and federal financing of project transmission facilities, are as follows:

Capacity - $23.40 per kilowatt per year
Energy - 2.40 mills per kilowatt-hour

As in the case of similar power values at the low tension side of the step-up substation previously submitted to your office, the above figures are based on the annual cost of power from an alternative steam-electric unit of 150 megawatts located in the system of the Public Service Company of New Hampshire and costing $160 per kilowatt. In the interim, the company has announced plans for the construction of a 350-megawatt unit at its existing Merrimack steam plant. Preliminary estimates indicate the investment costs for this unit are $120 per kilowatt. The new unit pro rata share of the cost of land and common purpose facilities would increase this to about $125. Considering its size, the new unit would be too large for the system to absorb on its load curve at the present time. For this reason the utility expects to share its output for a long

period of years with other systems operating in New Hampshire, Maine and Vermont.

The capital cost of the Pontook project step-up transformers and associated switchgear is estimated at $800,000 with annual costs based on federal financing, of $84,700. Total substation capacity is 150 Mva in two 115/13.8-kilovolt transformers.

It is understood that the dependable capacity of the Pontook project to be employed in the economic analysis will be taken as the plant capability at minimum head (90,000 kilowatts) plus one-half of the difference between that capability and the installed capacity (22,500 kilowatts) resulting in total average dependable capacity over the life of the project of 112,500 kilowatts. This is in accordance with well established procedures used by the Corps and the Federal Power Commission in computing capacity benefits at hydro-electric projects having power storage. On this basis the total capacity benefits of the Pontook installation (@ $23.40/kw-yr.) would amount to $2,632,500. In addition the 1,800-kilowatt installation at the reregulating dam would provide capacity benefits amounting to $42,120. Average annual energy benefits for the 117.1 million kilowatt-hours generated at Pontook (@ 2.4 mills/kwh) would total $281,040 and the 12.5 million kilowatt-hours provided by the reregulating dam installation - $30,000.

If we can be of any further assistance in your Pontook power studies, please let us know.

Sincerely yours,

D. J. Wait
Regional Engineer

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 BROADWAY
NEW YORK, NEW YORK 10013

July 13, 1964

Division Engineer
U. S. Army Engineer Division, New England
424 Trapelo Road
Waltham, Massachusetts 01254

Dear Sir:

Reference is made to your letter of June 10, requesting our comments on the proposed draft of the Power Studies Appendix of the report on the Androscoggin River Basin for flood control and allied purposes.

Our staff has reviewed the pertinent data submitted with your letter and generally concurs with the draft of power studies as presented. It is understood that further consideration will be given to site location, increased capacity and larger reregulating pool for the Pontook project during the detailed design stage. Further review of the power potentialities of the Hale project disclosed that power at this site would not be feasible.

As requested, there is returned herewith one copy of the draft with some minor corrections added.

Sincerely yours,

D. J. Wait
Regional Engineer

Enclosure - 1

EXHIBIT I - 3

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 Broadway
New York, New York 10013

May 28, 1964

Division Engineer
U. S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham 54, Massachusetts

Dear Sir:

In connection with your current investigation of the Androscoggin River Basin, we have made an estimate of the value of potential downstream energy benefits to existing installations that would result from summplemental regulation provided by the proposed Pontook project in New Hampshire. This determination was made in response to a telephone request from Mr. William Slagle of your staff on May 20, 1964.

According to the Federal Power Commission's recently published Status Report on the Androscoggin, there are 161 megawatts of hydroelectric capacity installed in existing plants on the main stem of the river in Maine and New Hampshire. This capacity is owned by utilities as well as by various industrial enterprises. The industrial portion, accounting for more than two-thirds of the total includes some direct mechanical-drive machinery with an equivalent capacity of 14.2 electrical megawatts. The following table shows the breakdown of this capacity by location and ownership:

Existing Hydroelectric Capacity

Main Stem of Androscoggin River
(Megawatts)

Ownership	Maine	New Hampshire	Total
Utility	31.9	17.6	49.5
Industrial			
Electrical	64.9	32.5	97.4
Mechanical 1/	14.2	-	14.2
Subtotal	79.1	32.5	111.6
Total	111.0	50.1	161.1

1/ Electrical equivalent of mechanical drive.

EXHIBIT I - 4/1

Industrial use of stream-flow for electric power production purposes usually differs markedly from that of an electric utility system, being primarily geared to the requirements of the particular manufacturing process involved. When industrial needs are less than available hydro generation, the excess is either disposed of to an interconnected utility as fuel replacement, or else there is spillage of water. Among the important factors affecting utilization of surplus industrial generation by a utility system are interconnection capacity between the two, system loading of transmission and generating facilities and relative economics of overall power supply at the time it is available. In 1963, Central Maine Power Company purchased 73 million kilowatt-hours from industrial sources and Public Service Company of New Hampshire, 20 million. Since most of the existing capacity is industrially-owned, maximum benefit to downstream users attributable to Pontook regulation may not be realized.

The value of energy considered applicable to downstream benefits is taken at 4.0 mills per kilowatt-hour for installations both in Maine and New Hampshire. It is based on the cost of power from conventional steam-electric stations on the Central Maine and Public Service systems, and consists of incremental production expenses and transmission losses.

Sincerely yours,

D. J. Wait

D. J. Wait
Regional Engineer

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 Broadway, New York, N.Y. 10013

May 19, 1964

Division Engineer
U. S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham 54, Massachusetts

Subject: Power Values - Proposed Pontook and Hale Projects
Androscoggin River Basin

Dear Sir:

As requested by Mr. William Slagle of your staff, this office has computed at-site power values applicable to the dependable capacity and average annual energy at the low tension bus of the proposed Pontook (N.H.) and Hale (Me.) hydroelectric projects in the Androscoggin River Basin. The values are as of January 1, 1964 and relate to an installation of 135,000 kilowatts at Pontook plus 1,800 kilowatts at the Pontook reregulating dam and 33,750 kilowatts at Hale. At-site values based on private and federal financing of the alternative power source, including transmission facilities for both hydro and its alternative are tabulated in the following:

		Pontook	Hale
Case A:	Capacity Value - $/Kw	16.90	19.50
	Energy Value - Mills/Kwh	2.4	2.6
Case B:	Capacity Value - $/Kw	22.50	21.50
	Energy Value - Mills/Kwh	2.4	2.6
Case C:	Capacity Value - $/Kw	8.80	10.60
	Energy Value - Mills/Kwh	2.4	2.6

EXHIBIT I - 5/1

Case A: Alternative steam plant and associated transmission facilities and project transmission privately financed

Case B: Alternative steam plant and transmission facilities privately financed and project transmission federally financed

Case C: Alternative steam plant and transmission facilities and project transmission federally financed. In this instance, it should be understood that the estimate of power value based on the cost of federally financed steam-electric plant is furnished at your request for your purposes. The Federal Power Commission in its work relating to river development projects, considers it unrealistic to evaluate power development at such projects using federally financed steam-electric sources of power as the basis of comparison.

The Pontook and Hale power values are based on the cost of power from conventional steam-electric generating units of 150 megawatts located on the systems of the Public Service Company of New Hampshire and Central Maine Power Company, respectively. Capital cost is taken at $160 per kilowatt, fuel costs at 32 cents per million Btu, and total net heat rate at 9200 Btu per kilowatt-hour. A capacity credit of three percent was applied to the at-market cost of alternative power and the energy value reflects a liability charge that takes into consideration the lower capacity factor operation of the project compared to its alternative.

Delivery of Pontook power would require approximately 140 miles of wood pole, 110 kilovolt transmission line consisting of 115 miles of double circuit line from the project to Webster Substation near Franklin, New Hampshire, and a single circuit line from Webster to Garvins. A tap-off would be made at Berlin. The alternative steam plant would need about 30 miles of double circuit, wood pole, 110-kilovolt line from Bow to Webster.

Power from the Hale project would be transmitted to Rumford and Norway by means of a single-circuit, 30-mile, wood pole, 110-kilovolt line. No transmission would be necessary in the case of the alternative steam unit at the existing William F. Wyman steam plant near Portland.

It is our understanding from recent discussions with your staff that we will be given opportunity to review the power studies and report on the Androscoggin River Basin before it is forwarded to higher authority.

Sincerely yours,

D. J. Wait
Regional Engineer

EXHIBIT I - 5/3

STATE OF NEW HAMPSHIRE
JOHN W. KING, GOVERNOR

STATE PLANNING PROJECT

THIRTY-FOUR BRIDGE STREET, CONCORD, N. H. TELEPHONE CAPITOL 56611

March 15, 1965

Mr. John Leslie, Chief
Engineering Division
U.S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham 54, Massachusetts

Re: Pontook Reservoir
Recreation Development Plans

Dear Mr. Leslie:

We have reviewed the draft of a report (Appendix G) on the Corps of Engineers' proposals for recreational development at Pontook Reservoir, Dummer, New Hampshire. We are pleased that the Corps is planning an extensive public recreation area at the reservoir, because the project will be a valuable addition to the recreational resources of New Hampshire. The large scale of the proposed recreation development is in keeping with the scale of the proposed 6,500 acre lake.

We believe that the Pontook Reservoir permanent pool, because of its large size and scenic qualities, will be a major recreational attraction in northern New Hampshire. The Corps' estimate of 110,000 visitor-days in a year upon completion of the recreational development at the project appears quite reasonable. Pontook Reservoir can meet the outdoor recreational needs of many of the year-round residents in Berlin and vicinity, and of the summer residents and visitors to that area of our State.

A feature of prime importance, we believe, is that the recreational facilities and the entire shoreline of the reservoir will be open to the public to enjoy. This situation is in contrast to New Hampshire's large lakes where almost all of the shoreline is privately owned. Too few places along those shores are open to the public to obtain access to the water for swimming, boating, and other water activities.

EXHIBIT I - 8/1

We hope to see in the final plans of the Corps of Engineers provisions for smaller public recreation areas on the reservoir in addition to the large area on Route 16. A water body of the size of Pontook can support a number of recreation areas to serve varied interests such as boating, and fishing, as well as swimming and picnicking.

Thank you for the opportunity to be kept informed of your plans for the development of Pontook Reservoir.

Sincerely,

Mary Louise Hancock

Mary Louise Hancock
Project Director

MLH/rjs

STATE OF NEW HAMPSHIRE
DEPARTMENT of RESOURCES and ECONOMIC DEVELOPMENT
DIVISION OF ECONOMIC DEVELOPMENT
STATE HOUSE ANNEX · · · CONCORD, NEW HAMPSHIRE
TELEPHONE - CAPITOL 5-6611

January 31, 1963

Mr. John William Leslie, Chief
Engineering Division
New England Division
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham 54, Massachusetts

Dear Mr. Leslie:

The following is an evaluation of the proposed Pontook Dam and Reservoir prepared for your consideration by the New Hampshire Division of Economic Development.

The Division believes that the Pontook Dam Project has excellent potential for the development of outdoor recreation facilities. The Division favors further study of the proposed multiple-purpose flood control project by the U. S. Army Corps of Engineers and other agencies which would include careful consideration of the provision of adequate swimming, boating, camping, picnicking and related outdoor recreation facilities, as well as other uses such as forestry, wildlife, and power features.

Some of the factors which have influenced our decision for support of creation of Pontook Dam and adjoining recreational facilities are:

1. At present there is a lack of lakes and ponds with swimming facilities open to the general public in northeastern New Hampshire in the vicinity of Berlin. (Refer to the attached tourist map of the area.') There are three state recreation areas in the vicinity of Pontook Reservior---Milan Hill State Park, South Pond Recreation Area, and Moose Brook State Park---and the latter two areas offer only limited bathing facilities. Creation of outdoor recreation facilities at Pontook Reservoir would help meet the recreation demands of the 17,820 residents of the City of Berlin, of residents of adjoining towns, and of numerous summer tourists who visit the area. The Division believes that Pontook Reservoir, if developed to the optimum, would exceed the estimate made by the U. S. Bureau of Outdoor Recreation of an annual visitation of up to 42,000 persons.

'*Not printed*

EXHIBIT I - 7/1

2. The countryside surrounding the proposed reservoir, and the site itself, has many desirable physical attributes for the creation of recreation facilities---scenic terrain, wooded hills, clear streams, pleasant summer temperatures---and is easily accessible by State Highway 16.

3. Creation of Pontook Dam and Reservoir would be a positive contribution to the lagging economy of the "North Country." At present the economy is based mainly on forestry, wood products and paper industries. It is estimated that only a small part of the income of this area is derived from the tourist dollar. A lake at Pontook Dam would open up opportunities for expansion of private vacation-travel businesses to meet the additional needs of the visitors to the area for accommodations, goods and services. A further economic effect of recreation development at Pontook Reservoir would be the encouragement of construction of seasonal residences and summer camps in the area. Seasonal residents are vital contributors to the economy of many New Hampshire towns today.

4. A number of residents of towns in the vicinity of Pontook Dam have expressed the desire that preliminary studies on Pontook be expedited with the aim of early construction of the project, which these residents believe will provide recreation and other benefits to the area. A private citizen and long-time resident of Drummer, New Hampshire, Mr. George Derby, recently presented the State Division of Economic Development with a petition of some 276 names, regarding Pontook Dam, which stated in part:

> "We, the undersigned, feel that this project is one which could very well have a very beneficial effect upon the economy of the northern part of the State of New Hampshire. For many years little has been done in regard to recreational development in the northern part of the State and we feel that this project would be of great value and would like to see it begun at the earliest possible moment, if possible."

We have the petition on file, should you wish to refer to it at some future date.

Another evidence of rising local interest in Pontook Dam is the fact that at the last meeting of the Coos County Rural Areas Development Committee, on January 10, 1963, in Lancaster, a panel discussion on "The Pontook Dam Situation" was held with the following speakers: Mr. William Slagle, of the Corps of Engineers, Mr. Elliot Priest of the New Hampshire Public Service Company, and Mary Louise Hancock, Planning Director, Division of Economic Development.

5. The Division is in favor of adequate flood protection for New Hampshire's towns, cities and rural lands, and therefore supports construction of Pontook Dam from this point of view.

At this point, the above comments, we feel, cover fairly well our main thoughts on the proposed Pontook Dam project. We shall be glad to cooperate on further planning for the proposed project and shall appreciate being kept informed of all activity related thereto. As you may know, we are soon to initiate a two-year study of outdoor recreation potentials for development in the State of New Hampshire. Pontook will be an important segment of that study.

Sincerely yours,

Mary Louise Hancock

MLH/dp
Encls.

Mary Louise Hancock
Planning Director

State of New Hampshire

Department of Public Works and Highways

Concord

ROBERT H. WHITAKER
DEPUTY COMMISSIONER
AND CHIEF ENGINEER

May 5, 1964

Mr. John Wm. Leslie
Chief, Engineering Division
U.S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham 54, Mass.

Attention: Mr. George Haskins

Dear Mr. Leslie:

This letter refers to your communication of February 26 dealing with the possible relocation of about 13 miles of Route 16 northerly from Milan and the raising of about 2 1/2 miles of the same route southerly from Errol.

The Corps' over-all proposal for handling the highway in connection with the proposed Pontook Dam is a satisfactory one. Should the project become firm, the Department would desire to study alternate locations before concurring in any final determination of alignment.

Typical section proposed by the Corps with a 24' width of travelled way and 4' paved shoulders is probably adequate although I would feel that wider shoulders would probably be justified as well as a pavement type of a higher grade than that provided by a bituminous surface treated gravel. The Department's engineering staff feels that the Corps' estimate of $3,373,000 for the relocated section of highway northerly from Milan is probably a reasonable preliminary figure. The Department's staff also considers that the $391,000 figure (Corps' estimate) for raising the section southerly from Errol is also a reasonable preliminary estimate.

Please feel free to contact the Department further should your office have additional questions concerning these matters.

Very truly yours,

R. H. Whitaker

RHW:r

EXHIBIT I - 8

STATE OF NEW HAMPSHIRE

WATER RESOURCES BOARD

STATE HOUSE ANNEX
CONCORD 03301

January 6, 1965

Mr. John Wm. Leslie, Chief
U.S. Army Engineer Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Leslie:

This will acknowledge receipt of your letter of December 17, 1964, together with attachments.

It is our understanding that Public Service Company of New Hampshire, which owns the site at Pontook, has requested the Federal Power Commission for a Preliminary Permit and since such Preliminary Permit if granted will give Public Service Company priority of application for a license while making the necessary feasibility studies, and since we will review Public Service Company proposals, if any, we feel that comment from us regarding the proposal by the Corps of Engineers should be withheld pending outcome of the application by Public Service.

Very truly yours,

Walter G. White
Chairman

wgw:c

EXHIBIT I - 9

COOS COUNTY

Rural Areas Development Committee

Court House, Lancaster, New Hampshire

July 1, 1964

Mr. William Slagle
Project Engineer
U. S. Army Corps of Engineers
New England Division
Waltham, Massachusetts

Dear Bill:

On behalf of the Coos County RAD Committee may I express our appreciation for your participation in the County RAD Meeting at Berlin City Hall on June 18th. Several RAD members have stated that this was one of the best RAD Committee meetings held thus far. Personally, I thought your presentation was excellent.

I am enclosing a copy of the Resolution unanimously adopted by the RAD Committee, while in executive session, immediately following the Public Meeting in Berlin on June 18th.

Again, many thanks for your fine cooperation.

With kind personal regards and best wishes.

Sincerely yours,

Dwight

Dwight G. Stiles
Executive Secretary
Coos County RAD Committee

enc:1
DGS:s

EXHIBIT I - 10/1

The following Resolution was unanimously passed by the Coos County Rural Areas Development Committee at a Meeting in Berlin, N. H. on June 18, 1964:

"WHEREAS the Public Service Company of New Hampshire has asked the RAD Committee of Coos County for support of its application to the Federal Power Commission for permission to make a three-year feasibility study of a multi-purpose dam involving hydro-electric power, flood control, and recreation on the Androscoggin River in the Town of Dummer, and

WHEREAS the Committee has gone on record, at a meeting in Berlin in February, 1963, supporting the idea of a similar study by the U. S. Army Corps of Engineers, New England Division, be it

RESOLVED 1) - that the RAD Committee of Coos County is chiefly concerned in this matter that such a dam involving recreation, flood control and hydro-power, should be built and as soon as possible,

2) - that, all things considered, it prefers to see the dam built by private industry, and therefore gives its support to the application of the Public Service Company to the Federal Power Commission for permission to make the three-year feasibility study, and

3) - that, if it develops that private industry cannot undertake the project within a reasonable time, the Committee reaffirms its hope, already expressed in a previous meeting, that the Corps of Engineers will construct the facility."

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
REGIONAL OFFICE
REGION 11
42 BROADWAY
NEW YORK 4, N. Y.

PUBLIC HEALTH SERVICE

January 26, 1962

In reply refer to:
24:WPC

Mr. John Wm. Leslie
Chief, Engineering Division
U.S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham 54, Massachusetts

Dear Mr. Leslie:

Reference is made to your letter of September 29, 1961 requesting our consideration of the need for and the value of storage for regulation of stream flow for the purpose of water quality control in the Androscoggin River. The additional storage for flow regulation would be provided by your proposed flood control reservoirs in the Androscoggin Basin at Pontook and on the Ellis and Swift Rivers. The amount of additional water that can be economically developed at each of the proposed sites has not been determined.

The dam at Pontook on the Androscoggin River would control a drainage area of 169 square miles below the control works at Errol, New Hampshire, while each of the dams on the Ellis and Swift River would control drainage areas of about 164 and 111 square miles respectively. The runoff from 1045 square miles of the Androscoggin is controlled at Errol, New Hampshire by the Union Water Power Company to guarantee a flow of 1550 cfs at Berlin, New Hampshire.

The flow downstream from Berlin is further regulated by several Hydro-electric installations. In addition a court appointed River Master, Dr. A. W. Lawrence sets weekly production quotas during the summer months for paper mills at Berlin, New Hampshire; Rumford, Maine; and Jay, Maine. These mills discharge untreated wastes to the Androscoggin River. The quotas are based on projected river flows by the Union Water Power Company and such river flows determine the amount of industrial pollution the mills can discharge to the river without creating nuisance conditions.

Section 2(b)(1) of Public Law 87-88 states that "In the survey or planning of any reservoir by the Corps of Engineers, Bureau of Reclamation, or other Federal agency, consideration shall be given to inclusion of storage for regulation of stream flow for the purpose of water quality control, except that any such storage and water releases shall not be provided as a substitute for adequate treatment or other methods of controlling waste at the source." It should be noted that it is the primary responsibility of the States concerned to require adequate treatment.

It appears at this time, that if present practices of discharging untreated wastes are to continue, the inclusion of storage for water quality control would be contrary to the provisions of the present Federal Water Pollution Control Act. In addition, in view of the quota system it is unlikely that additional flows would bring improved quality.

If adequate treatment were provided at the mills, it is possible that the inclusion of storage for water quality control might be beneficial. If this occurs, we would recommend a re-evaluation of this matter at that time.

It appears from our investigation that water supply storage might be considered for the proposed reservoir on the Swift River. The towns of Mexico and Rumford have been conducting investigations for additional public water supplies. We would be pleased to investigate this matter further under Title III of Public Law 500 and would also be pleased to discuss this matter further with you.

Sincerely yours,

L M Klashman

Lester M. Klashman
Regional Program Director
Water Supply and Pollution Control

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGIONAL OFFICE

PUBLIC HEALTH SERVICE

Region I
120 Boylston Street
Boston, Massachusetts 02116

April 9, 1965

Mr. John Wm. Leslie
Chief, Engineering Division
U. S. Army Engineer Division
New England
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts

Dear Mr. Leslie:

In a letter dated April 26, 1963, the New England Division, Corps of Engineers requested review and comments on matters of interest to the Department of Health, Education, and Welfare relative to the proposed Pontook Dam and Reservoir located in Dummer, New Hampshire on the Androscoggin River. The Corps letter also noted the response by this office in a letter dated January 26, 1962, which presented a preliminary evaluation of the Pontook Project.

The authority for this study is (1) the Memorandum of Agreement dated November 4, 1958, between the Department of the Army and the Department of Health, Education, and Welfare, relative to Title III of the Federal Water Supply Act of 1958, as amended (43 U. S. C. 390b) and (2) the Federal Water Pollution Control Act, as amended (33 U. S. C. 466a (b)).

In the past several years conditions on the Androscoggin River have changed considerably since our preliminary evaluation of January 26, 1962. The Androscoggin River has historically been polluted by the wastes from the pulp and paper industry; but, in recent years, discharges of sulfite waste liquors have been discontinued at Berlin, New Hampshire and Oxford, Maine, and it is expected that such discharges will be discontinued at Livermore Falls, Maine by the summer of 1965. This discontinuation of the sulfite process has noticeably reduced the pollution in the river; however, the discharge of wastes from sulfate pulp and paper production without treatment still remains a major pollution problem. Large expansion programs presently under way at the three major companies along the river will contribute additional pollution to the stream.

Due to the changing character of the pollution load in the Androscoggin River, this office has initiated a detailed study of the water quality control needs of the river. As part of the Public Health Service's study procedures,

a mathematical model has been formulated to simulate and project the water quality conditions of the river and to determine from available data the waste assimilation capacity of the Androscoggin River. This model has been programmed into a high-speed digital computer in order to determine the effects of future waste discharges, river flows, and varying temperatures on the water quality of the Androscoggin River. Information recently available from the States of Maine and New Hampshire will be instrumental in accurately characterizing the model for the Androscoggin River.

When the present effects of pollution are adequately defined and future waste productions estimated, the resulting water quality will be predicted for future years and the need for and value of storage for water quality control determined. Such storage requirements will be based on the premise that fulfillment of the adequate treatment provision of the Federal Water Pollution Control Act will be accomplished. Suitable assurances of this goal will be required before storage can be provided by the construction agency.

Within the scope of the study, municipal and industrial water supply needs will also be evaluated. This evaluation will be within the reasonable confines of the project area and along the river proper.

This study is scheduled for completion and submission of a report to the Corps of Engineers in September, 1965. In view of the completion date of this study, it would appear that the effect of increased streamflow from your proposed Pontook project should be evaluated during project design studies.

Sincerely yours,

Earl J. Anderson

Earl J. Anderson
Acting Regional Program Director
Water Supply and Pollution Control
Public Health Service

ATTACHMENT II

Information Called for by

Senate Resolution, 85th Congress

Adopted 28 January 1958

ANDROSCOGGIN RIVER BASIN

MAINE AND NEW HAMPSHIRE

ATTACHMENT II

ANDROSCOGGIN RIVER BASIN

MAINE AND NEW HAMPSHIRE

1. INTRODUCTION

The information in this supplement is furnished in response to Senate Resolution 148, 85th Congress, adopted January 1958.

2. RECOMMENDED PROJECT

a. Project Description and Economic Life. The Pontook project, as presented in the report, will consist of a multiple-purpose dam and reservoir on the Androscoggin River in the town of Dummer, New Hampshire. The project would serve the functions of flood control, power generation and recreation. Two dams will be constructed, a main dam to perform the primary functions of the project, and a small reregulating dam, located about 3.5 miles downstream of the main structure in the town of Milan, to smooth out and reregulate the turbulent discharges from the power plant at the main dam. In reregulating the discharge to uniform flow, it was determined that facilities for the generation of hydroelectric power are also feasible and economically justified at this dam.

The main dam, a rock-fill structure, will be about 2,000 feet long with a maximum height of 115 feet at the river bed. A side channel spillway and an adjacent gated flood control outlet structure will be constructed in the east abutment of the dam. A power house with two 67,500-kilowatt generating units for peaking power purpose and a gated intake structure will be located at the downstream and upstream toe of the dam, respectively. Two 32-foot diameter penstocks will extend between the power house and the intake structure. A log sluiceway conduit will be constructed adjacent to the penstocks. The reservoir created by the main dam will provide storage of 58,000 acre-feet for flood control purposes, and 141,000 acre-feet for power generation.

The reregulating dam will be of rolled earth fill, approximately 2,500 feet long, including a spillway 155 feet long, with a maximum height of 57 feet. A gated outlet structure with a power house on the downstream

face will be constructed in the west abutment of the dam. Gates will be provided in the structure to control the discharge from the pool impounded by the reregulating dam, the flows to the single, horizontal 3,000-kilowatt generating unit in the power house, and the flows to the log sluiceway.

Subject only to the safety of the public and the operation of the project, all project water and contiguous land areas will be available to the public for recreational use. The lake created by the maximum power pool in the reservoir will have a surface area of about 10 square miles and a length of about $13\frac{1}{2}$ miles. Since the normal operation of the power pool during summer seasons results in a drawdown of only one foot or less, the use of the lake for recreational pursuits will be assured.

A more complete description of the project is given in paragraph 35 of the main report and in Appendix E.

The proposed project has been evaluated on the basis of a 50-year and 100-year economic life. To insure such a project life, major replacements of mechanical and electrical equipment will be required.

b. Project Costs. Project first costs are based on average bid prices for similar work in the same general region, adjusted to 1964 price level. Costs of electrical, mechanical, and hydraulic equipment was obtained from published prices and consultations with manufacturers. Benefits realized by the construction of the project in a Redevelopment Area, so designated by the Area Redevelopment Authority under Section 5b (6) of Public Law 87-27, are credited to the project. Annual charges are based on an annual interest rate of 3-1/8 percent with amortization of the project cost distributed over the project life. Allowances are made for the maintenance and operation of the project and tax loss on lands transferred to Federal ownership.

The estimated first costs are summarized in Table 4 of the main report with details in Appendix E.

c. Benefits. The total average annual tangible benefits that would be realized from the project are shown on the following page.

Source of Benefit	Project Life 100 Years	50 Years
Flood prevention	$ 204,000	$ 201,000
Hydroelectric power	3,594,000	3,594,000
General Recreation	289,000	250,000
Area Redevelopment	148,000	179,000
Total Project Benefits	$ 4,235,000	$ 4,224,000

d. Intangible Benefits. In addition to the tangible benefits noted in the paragraph above, important intangible benefits will be realized from the construction of the Pontook project. Among these are prevention of possible loss of life, prevention of disease caused by flooding by polluted waters; and the stabilizing effect on community life in the valley by the removal of the flood threat.

e. Physical Feasibility and Cost of Providing for Future Needs. All foreseeable future needs have been considered in formulating the project. The recommended improvement will reduce flood flows along the entire length of the Androscoggin River from Berlin, New Hampshire to tidewater and provide substantial protection to presently flood prone properties.

The project will also provide for a portion of the anticipated future power requirements of the region. According to the Federal Power Commission and the Department of the Interior, which has the responsibility for marketing the power, all project power will be usable and marketable at the time of project completion.

Provisions are also made for meeting the estimated initial needs of recreation. Additional facilities, costing an estimated $1,200,000, will be constructed as the demand for such facilities grows over the project life.

Construction of the project as proposed in the report will be a significant element in the comprehensive development of the water resources of the Androscoggin River Basin.

f. Allocation of Costs. Cost allocations among the project purposes of flood control, power and recreation, by the separable costs-remaining benefits method, the priority of use method, and the incremental cost method, and for project lives of 100 years and 50 years are summarized in Table II-1.

g. Extent of Interest in Project. Statements presented at meetings and correspondence show that both state and local officials, as well as residents of the area, generally favor the proposed improvement because of the benefits it will bring to the lagging economy of that part of the State.

h. Repayment Schedules. A marketing analysis performed by the Department of the Interior indicates that power revenues obtained from the project will be sufficient to pay power production costs and repay the Federal investment allocated to this project purpose within a 50-year payout period.

i. Effect of Project on State and Local Governments. The project will have little adverse effect on State and local governments other than loss of taxes on land required for project purposes. Interested New Hampshire agencies concur in general with the plans for the improvement. Costs of adjustments to State highways are considered to be adequately provided for in the cost estimate.

3. ALTERNATIVE PROJECTS

All practicable alternative methods for solving the flood and related water problems in the basin were considered. These included reservoirs for flood control only, other multiple-purpose reservoirs, channel improvement works, and dikes and flood walls. None was economically feasible at this time due to limited benefits and/or their failure to fully develop the water and related resources. The greatest excess of benefits over costs which can be realized from the projects investigated will be from the recommended plan, providing flood control, hydroelectric power, and recreation as project purposes.

TABLE II-1

SUMMARY OF COST ALLOCATIONS
PONTOOK PROJECT
(All Amounts in Thousand Dollars)

	100-YEAR PROJECT LIFE					50-YEAR PROJECT LIFE				
	Flood Control	Recreation	Power	ARA	Totals	Flood Control	Recreation	Power	ARA	Totals
SEPARABLE COSTS REMAINING BENEFITS METHOD										
Allocated First Cost	5,086	4,274	46,640		56,000	4,472	3,483	48,045		56,000
Allocated Annual Charges	192	237	1,997		2,426	200	225	2,397		2,822
Annual Benefits	204	289	3,594	148	4,235	201	250	3,594	179	4,224
Benefit:Cost Ratio	1.1	1.2	1.8		1.8	1.01	1.1	1.5		1.5
PRIORITY OF USE METHOD										
Allocated First Cost	5,087	5,682	45,231		56,000	4,211	4,122	47,667		56,000
Allocated Annual Charges	204	289	1,933		2,426	201	250	2,371		2,822
Annual Benefits	204	289	3,594	148	4,235	201	250	3,594	179	4,224
Benefit:Cost Ratio	1.00	1.00	1.9		1.8	1.00	1.00	1.5		1.5
INCREMENTAL COST METHOD										
Allocated First Cost	17,270	1,171	37,559		56,000	17,245	1,189	37,566		56,000
Allocated Annual Charges	664	116	1,646		2,426	789	119	1,914		2,822
Annual Benefits	204	289	3,594	148	4,235	201	250	3,594	179	4,224
Benefit:Cost Ratio	0.3	2.5	2.2		1.8	0.3	2.1	1.9		1.5